COAL AGE

Volume 14 — New York, August 1, 1918 — *Number* 5

A Voice from the Trenches

Written expressly for Coal Age
by Rufus T. Strohm

For the love of Mike, pal, looky here
At the things the papers say!
Them minin' chaps must be gettin' queer,
Or at least it seems that way;
For they work three hours, or mebby four,
At the bottom of the pit,
An' they've earned enough for a day, an' more,
So they grab their pails an' quit.

Well, what do you think of that, old scout!
Now, wouldn't it jar you, hey?
They're hardly in till they're up an' out,
But they call it a workin' day!
An' the country yells, for the notion grows
It'll freeze its ears an' beak,
Yet the miner's time card seldom shows
More than thirty hours a week.

By the great gran'dad of Jehoshaphat!
Just suppose that you an' me
Went about our work in a way like that—
Where the devil would we be?
Why, Fritz would come with his sneaky face
An' his shifty, piggy eye,
An' me an' you'd find a restin' place
Underneath the wavin' rye.

No, the job we've got don't start an' stop
With the strikin' of the clock,
For we're wide awake an' we up an' hop
Ev'ry time that the Boches knock;
An' the hours come, an' the hours go,
An' the sun swings round to sun,
But we keep right on, for we never know
Any rest till the fightin's done.

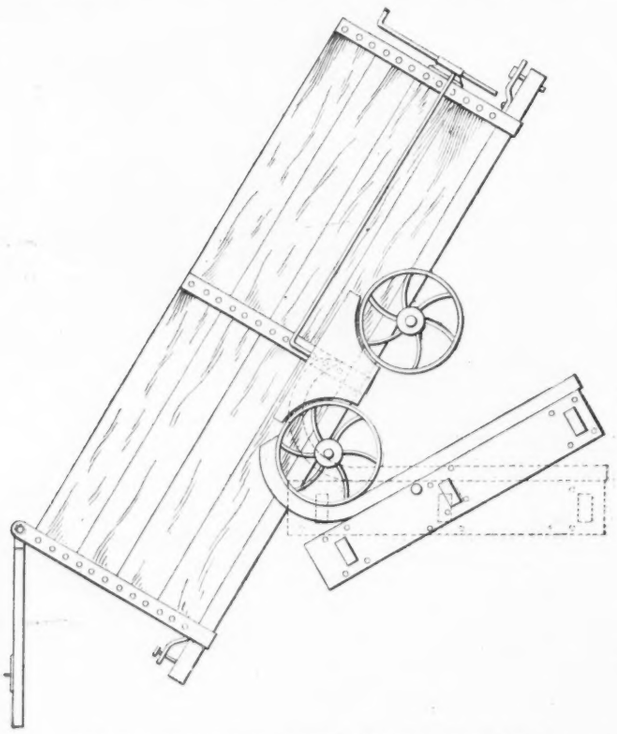
They've done good work, have the minin' guys,
When they've had to meet the test,
An' I'd be the last to criticise
If they'd done their level best;
But to blow an' brag of their skill an' speed
Is a bloomin' bit of cheek,
For the war for freedom won't succeed
Workin' thirty hours a week!

IDEAS AND SUGGESTIONS

Finding the Dump Pivot

BY T. F. PRICE
San Antonio, Texas

The old style horn dump, as shown in the accompanying illustration, is still extensively used in some regions. It finds greatest application in slate dumping and in development work. The most difficult point to determine in building these dumps is the proper location of



DUMP AND CAR IN DISCHARGING POSITION

the pivoting point. If this point is properly located, the dump will discharge the contents of the loaded cars and return to normal position without manual aid.

The proper location of the pivot or dump axle may be found by the aid of the following rule: To one-half the wheelbase in inches add one-half the wheel diameter in inches minus three. This gives the horizontal distance from the rear axle of the car to the dump axle in inches.

The horizontal distance from the center of curvature of the horns to the dump axle would of course be the difference between the wheelbase and the distance found above.

A dump of this type should only be allowed to tip through an angle of about 30 deg., the car being permitted to pass on through an additional angle of about 30 deg., making a total inclination of the car bottom of about 60 deg., the first one-half of which is turned about the dump axle and the second half about the front axle of the car.

After the coal has been discharged from the car its rear wheels return to the dump rails with sufficient force to cause the dump to return to its normal position. A dump of this kind may be constructed easily in the mine shop, and if proper care is exercised in its construction such a dump may be made to work perfectly.

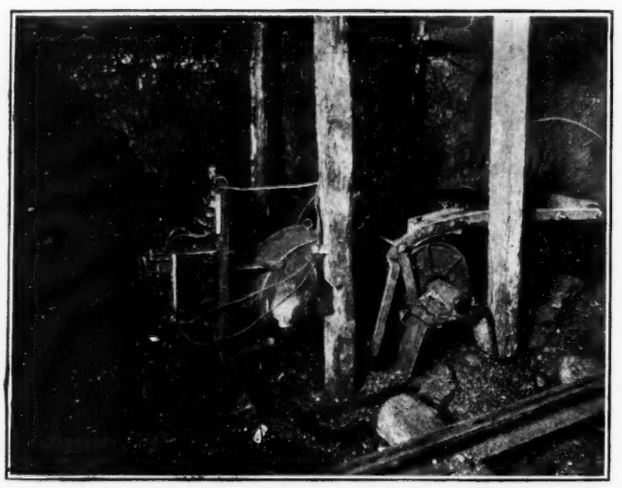
Speeding Up Mining in Shallow Drifts

BY G. H. KIRCHGASSER
Milwaukee, Wis.

An ingenious method of overcoming difficulties in coal haulage has been in operation for some time in the mine of the Logan Coal Co., Beaverdale, Penn. Some drifts in this mine are so low (about 3 ft. headroom) that it is impossible for mules or battery locomotives to enter them. But to mine the coal in these pockets is of course important today in order to meet the demands.

The coal bed in some places in this mine was found to be only about 38 to 44 in. thick. Underlying this was soft shale and earth. To excavate the rooms deep enough to allow mules or locomotives to be used would have meant the employment of many miners, which in the face of a declining labor supply was next to impossible. And even should enough men have been available the cost of the yardage, including the shale and earth, would have made such a method unprofitable.

To avoid extravagance in the use of men and money and still extract the coal from these beds, a scheme was



HOIST HAULS MINE CARS INTO THE ROOM

devised that has proved so successful that since the first operating unit was installed 100 others have been added and the plan adopted throughout the mine.

A pocket is constructed in a drift driven at a slight inclination and off the main heading. The empty car is brought from the main heading and hauled into the pocket by means of a cable wound on a winding drum driven by an electric motor that is automatically started

and stopped by means of an automatic controller. The cable passes around a sheave wheel located at the head of the room and thence to the motor-driven winding drum.

At the entrance to the pocket an electric switch is placed, which when closed energizes the automatic controller which starts and accelerates the motor. The winding drum thus reels up the cable and the car is

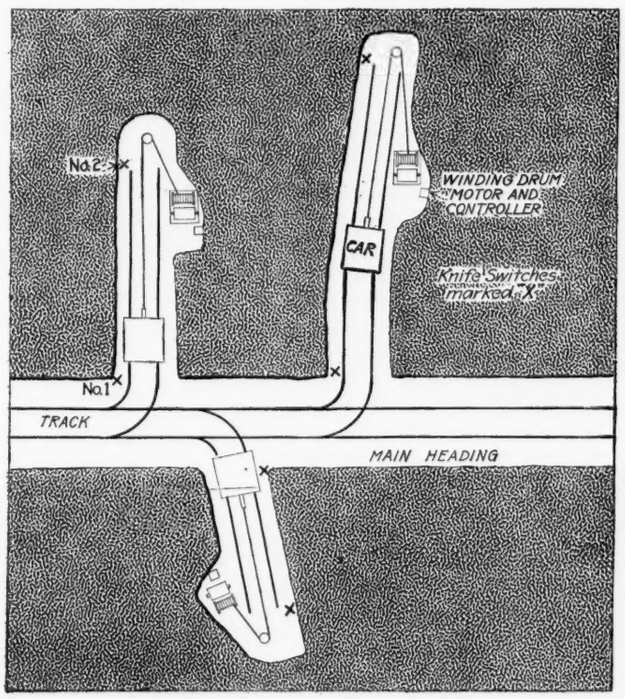


DIAGRAM OF OPERATION OF ROOM HOIST

hauled into the room, where it is loaded by the miners. As will be noted from the diagram, there is another switch which is conveniently placed for the operator in the pocket. This the miner opens to shut down the motor, thus giving easy control of the outfit at both ends of the car's travel.

When the car is loaded it is only necessary to release the brake and it quickly coasts down the grade to the main heading, where the cable is disconnected and the car is ready to be hauled out of the mine. Another car is hauled into the pocket by attaching the cable to it and closing switch No. 1 again. One miner can do this—ride on his car into the pocket, throw out the switch, fill the car and coast back to the main heading ready for hooking onto another empty. However, to facilitate the work, there are usually two men to a room. Sufficient cable is provided on each winding drum to take care of rooms of various lengths. Filled cars are assembled in the main headings and hauled away.

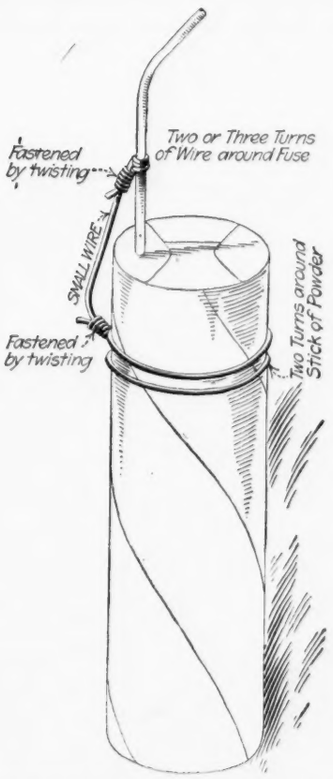
The equipment for hauling the cars by cable into the shallow drifts consists of a compound-wound, 3-hp. motor, the cable-winding drum and a C-H type automatic controller which automatically starts the motor when either of the two control switches x are closed, and stops it when they are opened. The controller is mounted on a panel secured to the motor so that the entire unit may be moved easily when work is completed in any location. Ordinarily the controller is placed in a metal case.

The cost of operating this hauling unit is small, since current is only used during the brief period when the car is hauled into the room. The current handled by the control switches x is but a fraction of an ampere, which is a big advantage from a safety standpoint because of the elimination of the danger of accidental burns, flashes or shocks.

Attaching Fuse to Primers

BY WILLIAM CROCKER

A method of attaching fuse to primers is shown in the accompanying illustration. I have made thousands of these primers with perfect success. The fuse is anchored to the stick of powder with wire obtained from the strands of an ordinary bell cord which is cut into lengths of about eight inches. After inserting the



HOW THE FUSE IS ATTACHED TO THE PRIMER

copper fuse in the regular manner, the wire is twisted around the cartridge, embedding itself into the wax paper. One end of the wire is twisted around the fuse two or three times. Such a tie will not slip or yield. The whole operation is accomplished quickly—*Engineering and Mining Journal.*

In view of what is known of the chemistry of the various kinds of fuels and the possible advancement of such knowledge in the near future, it is questionable whether the method used in attacking the smoke problem was the best as regards fuel economy. The persistence of smokiness in burning bituminous coals shows that there is room for improvement in methods of burning.—*Bureau of Mines Bulletin No. 135.*

Concrete Foundations, Drift Linings and Reservoirs

By J. F. SPRINGER
New York City

SYNOPSIS—*Concrete foundations for machinery do not as a rule require reinforcement. Here weight and ample bearing area are prime requisites. On yielding soils piling or piers are sometimes required. Concrete drift linings are frequently used. These are usually arched and reinforced. Large tanks and reservoirs are sometimes built. If of large size these require expansion joints.*

THE coal-mine management will at times have uses for concrete where the tensile strength will be of minor consideration. In such cases the reinforcement may be reduced to a small amount or omitted altogether. One caution may be relevant, however. If the foundation, or whatever it may be, is pre-molded, account must be taken of any tensile stresses that may arise in moving it to its final position.

Foundations for reciprocating steam engines, air compressors, etc., will have to withstand a certain amount of vibratory shock. Ordinarily, the foundation may be constructed satisfactorily without reinforcement. Sometimes further economies are quite permissible. Thus, if the general mass is considerable, "plums" may be used to take the place of some concrete. Such plums (boulder or other rock) should be sound and free from half-detached fragments. The surface should be clean so as to insure a good bond with the enveloping concrete. An efficient way to cleanse plums from clay and other foreign matter is to use a jet of live steam. Another economy consists in providing vacant spaces in the mass at locations where nothing is really required. A considerable cavity may at times be left running like a tunnel from one side of the foundation to the other.

Above ground it will be desirable to have smooth and regular surfaces. Forms will here be needed to give the proper general shape to the mass, so that smoothness and regularity can be obtained. Wood will generally leave an imprint, and the crevices between planks will be represented in the block. If it is desired to avoid these, one of the best means to this end is to use a steel plate lining. The metal should be free from rust and should be greased before the concrete is poured. Crude vaseline, thinned with kerosene, will provide a suitable coating, the object of which is to prevent the concrete from attaching itself. Where wood is used it may be thoroughly wetted down ahead of pouring, the same purpose being in view; or, it may be greased. Below ground the foundation block will frequently require no other form than the sides of the excavation. Irregularity will here be no serious matter.

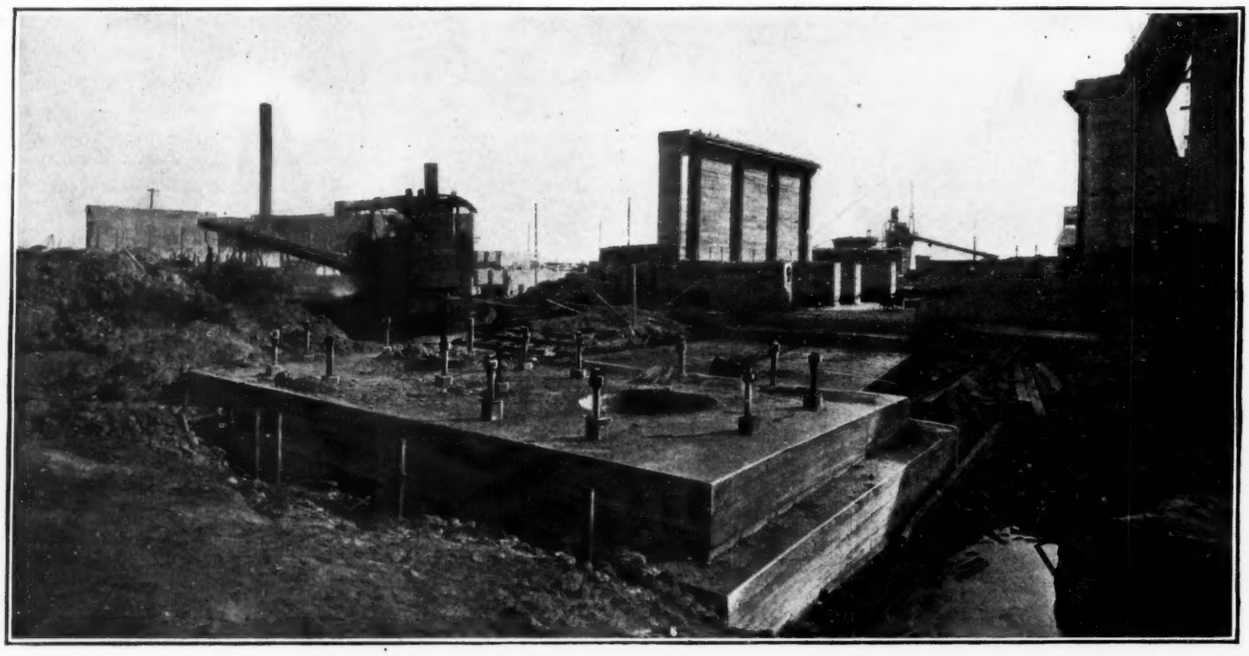


FIG. 1. LARGE CONCRETE FOUNDATION WITH HOLDING-DOWN BOLTS IN PLACE

Concrete foundations and other concrete structures may be built upon a variety of materials. Bearing piles of wood or concrete are suitable. If wood is used and water is present, the heads of the piles should be, say, 1 ft. below the water level to insure that they will not be subjected alternately to water and air. The

FIG. 2. TOPS OF CONCRETE PILES

concrete may then have its base 1 ft. below the pile heads. Concrete piles may be used instead of wood, but the latter has an indefinite life if perpetually submerged in water possessing no substantial chemical action.

If concrete piles seem necessary, there are numerous varieties that are suitable. The pile may be pre-molded and then driven after maturity. Reinforcement will be necessary to cover transportation, handling and driving shocks, and stresses. A conical sheet-steel shell may be forced down and then filled with concrete. This system is probably patented. A similar system, and one that I think is unpatented, is to force down section after section of cylindrical steel shells. At the bell and spigot ends these need reinforcing bands, which are made of moderate thickness and may well be 12 or 14 in. in diameter. They may be driven with the bottom end closed or open. Where driven with closed end, a cast steel tip is provided. Where driven with the end open, it is necessary to clean out the interior after driving. A miniature orange-peel grab bucket may be secured small enough to suit the 14-in. shell. In fact a bucket 10 in. in diameter actually has been used.

However driven, the shell may contain water. This may or may not be removed. In the former case we may close the bottom by a concrete seal as a preparatory measure. If the water is allowed to remain, we may fill in the concrete by using a bottom-dump bucket; or we may employ a tremie, which is a simple device for placing concrete under water.

The steel shells, whether conical or cylindrical, are left in place. To withdraw the shell and leave soft concrete in the soil would be a somewhat doubtful procedure. The pile might or might not be pinched in two by constrictive action of the soil.

A caution might well be given at this point relative to the difference between a pile and a pier. A pile is supported, in part at least, by skin friction; a pier derives its support from the material beneath its foot or base. If a pile is put down through material supplying no skin friction—as thin mud, quicksand, water—then we may have really a pier. This will be satisfactory if the pile will resist buckling and all wrong if it does not. Naturally, if a pile is really to perform the service of a pier it should be suitably reinforced.

In most cases piling under foundations will be unnecessary. The block is based immediately on the soil or rock. Clay is, however, not to be accepted as a satisfactory footing without knowing something more than that it is just clay. The possibility of its being partially carried away by water is to be considered.

Sand is a good support for concrete, particularly if it is clean and compact. Quicksand must be vigorously avoided. Ordinary alluvial soil will often be satisfactory. Lof and Rushmore consider 1000 lb. to a square foot a proper allowance for such soil for machinery foundations.. But they also say, "For soft or alluvial soils piling is almost always required." This is, however, a question of weight of machine and block, and of area of foundation base.

The permissible pressures on concrete vary, partly because the factor of safety to be allowed is a matter of controversy. It is understood that in Boston the building laws permit only a maximum of 55 lb. per square inch; while in New York they sanction pressures up to 200 lb. per square inch.

These permissible loads probably contemplate no considerable vibrations. Where a rock crusher or similar machine is to be installed, account must be taken of the continuous shock and jar, and adequate allowance made. In all cases, whatever the underlying material, the block may be flared out so as to secure a greater total support.

Where the block rests on the surface or has only a shallow excavation, it may be necessary to tie it to the rock or other support. To do this, tie-rods or dowels are embedded in the base of the block and in the underlying material. There are, according to A. Del Mar, three most popular forms for these rods. (See Fig. 4). All have a knob at the upper end. They differ in the form given to the lower extremity. In one case the lower end is furnished with upward-

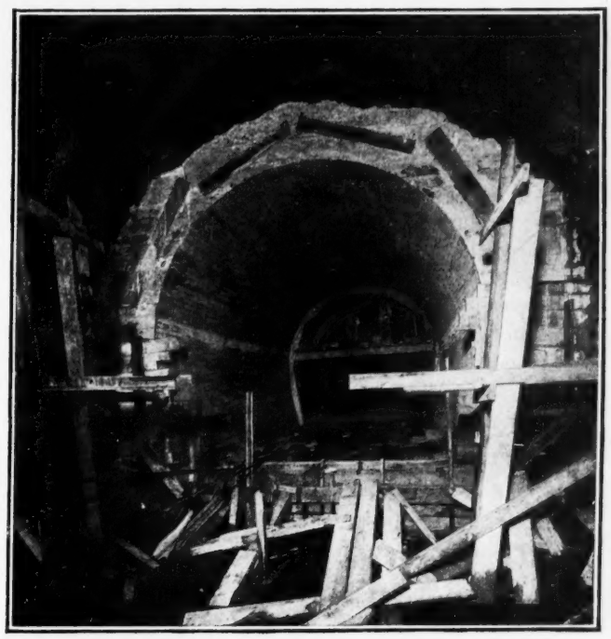


FIG. 3. END VIEW OF CONCRETE TUNNEL LINING

pointing barbs made by driving a chisel obliquely into the side of the rod. The barbs may be arranged on all sides and to cover a foot or two of the lower end of the bar. The gross diameter of the barbed portion should be larger than the hole in the bedrock; the shank should be distinctly smaller. When this bar is driven into the rock the barbs give a little, but they resist an effort to pull the bar out. One of the other popular forms is made by splitting the bottom end for a few inches and inserting a suitable wedge. The third form is made simply by upsetting the metal at the bottom end until a considerable bulge is formed.

In all cases, after the hold-down rods have been driven into place in the rock, the holes are to be filled with cement grout or mortar. In the latter case a proper formula for proportioning cement and sand is 1:1. A good foundation is said to have been secured in a stiff blue clay by means of such tie-rods. They were arranged to radiate from the foundation block and thus secured an extended area of grip on the clay.

It will ordinarily be necessary to use a rich mixture of concrete for machinery foundations. Lof and Ruthmore in their recent work on "Hydro-Electric

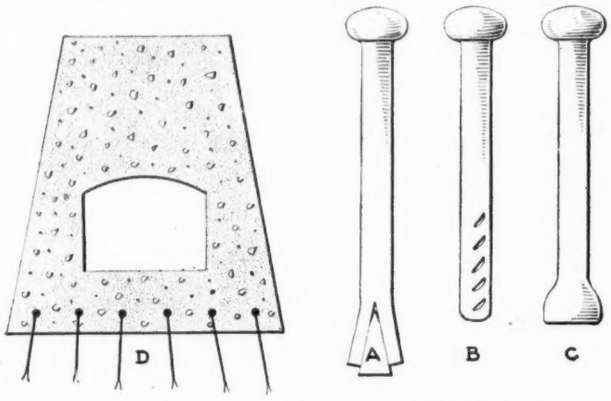


FIG. 4. VARIETIES AND ARRANGEMENTS OF FOUNDATION DOWELS

Power Stations," say: "A mixture of one part cement, three parts sand and six parts gravel or broken stone forms a concrete that is extensively used, and which has given perfect satisfaction for machine foundations." We may, of course, use this same mixture for any other similar use.

The concrete should not be brought to quite the level of the underside of the bedplate of the engine, compressor or other machine. About 1 in. is a proper vertical interval to allow. Assuming that the machine anchor bolts have already been set in position and that the machine has been placed with all the bolts in their holes or slots in the bedplate, the next step is to block it up 1 in. Steel or iron blocks and wedges or shims may be used for this purpose. These blocks may naturally be placed before the machine is let down at all, provided they are not liable to displacement. The machine is now leveled and oriented with the degree of precision that may be necessary for the particular case. These adjustments should be made as perfect as ever will be desired, as it will not be an easy matter to correct them later on when the machine has been grouted to the block and the grout has hardened.

There seems to be a difference of opinion as to whether it is better to use a thin, easy-flowing grout poured in to the proper level or a rather stiff grout well packed beneath the bedplate. The latter procedure is preferred by a large engine company. The packing is done by hand, with the aid of a metal rod or bar with a suitable flat surface to force the grout into place. A suitable tamping rod may be made by cutting off a short length, say 16 to 20 in. long, from a flat bar ¼ in. thick and 1¼ in. wide. A block may be held as a kind of backstop for the half-dry mortar when we use the tamping rod. In this way we are able to pack the mortar tightly. The rod may well be used, now on the outside of the bedplate flange and now on the inside, the idea being to get a hard, compact layer of mortar underneath the flange for its full width. It is claimed by some that a soft, easy-flowing mortar cannot be made to set properly against the under surface of the frame. In consequence "the machine is pulled out of line when the foundation bolts are tightened up. Many engine troubles are occasioned by this way of setting."

A good mortar for grouting in machines follows the formula 1:1½. The sand and cement are first to be mixed dry. A small amount of the dry mixture may then be dampened enough to make it "about as damp as molding sand, or just so it will hold together when pressed into a ball by the hand." After this dampened mortar has been used up, another batch is wetted and used immediately. The concrete surface of the foundation should be thoroughly cleaned and wetted before applying the grout. A warning is to be given here. A quick-setting cement may develop heat. This may or may not be sufficient to affect (expansively) the iron in the bedplate to an appreciable amount.

Reference has been made to the anchor bolts which hold the machine to the foundation block. In some cases it is desired to have these removable. Vertical holes are arranged and the bolts provided at their bottom with a removable head or nut which bears directly or indirectly against a shoulder in the concrete at the bottom of the holes. Essentially, these bolts are long rods threaded at both ends and provided with nuts, etc., by means of which the machine and foundation are bound together. The cavity in the concrete block where the bottom accessories of the rod are located may be accessible or inaccessible from one side of the block. Where the anchor rods are not removable, it is customary to embed the lower ends in the mass of the concrete. There may be a washer plate and nuts, as in the case where a removable anchor bolt is installed, only in the present instance these are embedded in the concrete mass and became part of it. Of course, the plate and nuts are there simply to add to the resistance to an upward pull on the rod.

Whether anchor bolts are removable or not, it is customary to provide either cylindrical or tapered holes extending down from the top of the concrete a considerable distance, thus securing a free space around this portion of the rod. The object in view is to make it possible to swing the upper end a moderate amount in any direction. There would, perhaps, be no need for bending the rods if the plan of the bedplate could be relied upon with respect to the positions of the holes or slots. It seems that in actual practice no substantial reliance can be put in any blueprint showing foundation bolt positions.

An annular space at the bolt top permitting a movement of 1 in. in any direction is good practice when constructing the foundation block. This space may be diminished to little or nothing at the bottom if a tapered hole is provided. As to the question of making a choice between a plain cylindrical hole and a tapered one, it may be said that the latter provides a better shoulder for the plate at the lower end of the rod when it is desired to have the whole thing removable. Where the lower half of the rod is actually embedded in the concrete mass and goes down into it well below the bottom of the hole, it will generally be altogether unnecessary to taper the hole.

Naturally, it is easy to provide a form for the cylindrical hole by simply using a piece of pipe. Whatever shape of form is used, it may be either left in or removed after the pouring of the concrete. If the bored on the under side to the depth of ¾ in. to provide seats for the upper ends of the casings.

At the bottom ends of the casings a steel washer of suitable size, when placed upon the rod to hold the casing central therewith, may be used. If the rod is to be irremovable, this washer may be left in. A washer of different metal from the rod should not be employed, as in that case electrolytic action may possibly be inaugurated later on.

In order to prevent concrete from entering the casing at the bottom and blocking up the hole more or less, this may be filled with loose material of such a nature as to be easy to remove later on. Paper, excelsior, etc., may be employed. In fact, this packing may sometimes be used to hold the casing central.

Where the rods are to remain in place the holes may, if desired, be filled with cement grout. This is

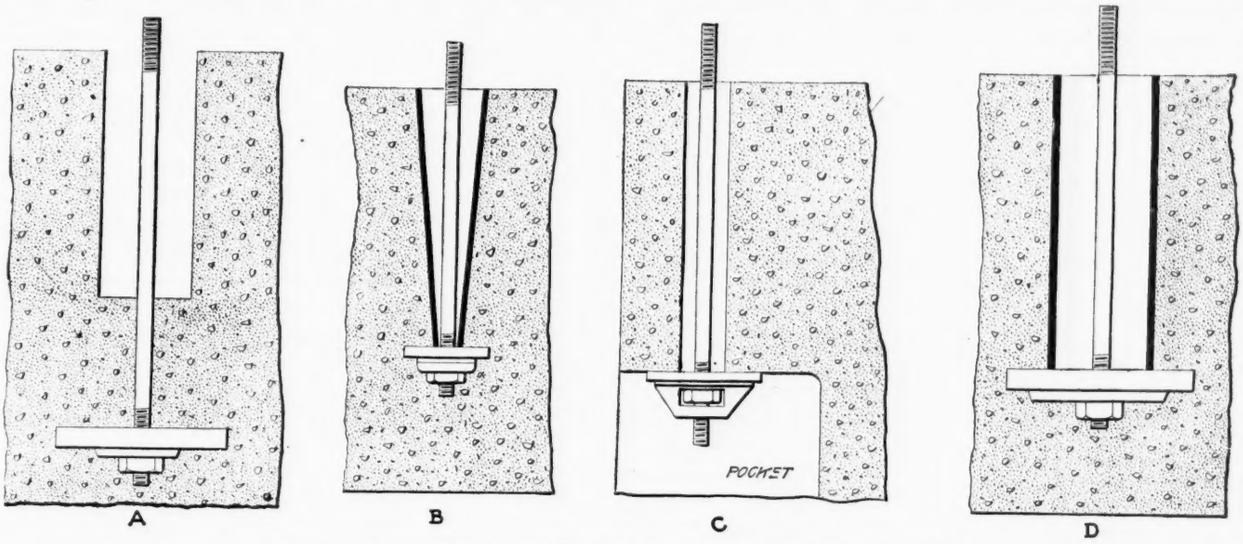


FIG. 5. VARIOUS METHODS OF PLACING HOLDING-DOWN BOLTS

form is not to be left in and a tapered hole is desired, a pyramidal wooden form may be employed.

The anchor bolts must be placed quite accurately before the concrete in which they are embedded is poured, and the casings must be located rather precisely with reference to the bolts. It is customary to use wooden templets as a means of suspending rods and casings and fixing their positions. After the wooden framework is ready, the exact locations of the bedplate holes or slots, as shown by the machine builder's blueprint, should be marked on it. At the proper locations holes are bored for the anchor rods. We have now a means of hanging them inside the form used for the foundation block.

The suspension of the casings will hardly be as easy a job. They must hang at a precise level, if they are to be left in, and they must be held central with the anchor bolts. The following method is perhaps one of the best for accomplishing this result. As a 1-in. space is to be left between the top surface of the concrete and the under surface of the bedplate, we may arrange blocks on the under side of the templet to reach down to, say, within ¼ in. of the level at which the pouring of the concrete is to stop. The blocks are located at the holes for the rods and are suitably bored to receive them. They are also counter-

not done until the machine is set in precisely the position wanted. It should be done, ordinarily, before the 1-in. space between foundation and bedplate is grouted up or simultaneously with this action. Whether to grout up the holes or not will probably be answered differently by different persons. Once this is done no slight variations in the bedplate positions can well be made. On the other hand, when grouted up, we are relieved of the necessity of paying attention to corrosive action or the like in so far as the bolt is concerned below the top of the block. Furthermore, we have undoubtedly a more rigid hold on the machine. On the whole, it appears to me that for a mine these two considerations ought to outweigh the first and give the decision to the hole grouted up to the top. The precise setting of the machine should be done at the beginning and should not need a second attempt.

What ought to be the length of the bolt in the hole and what the length of the bolt embedded in concrete? As to the former, good practice seems to warrant making it 25 or 30 times the diameter of the rod. It is simply a question of what ought to be the length of a rod which is to be deflected 1 in. by bending. As to the latter question, no such short answer can be given. Deep embedment will be advisable where strong resistance is to be provided. Generally speaking, the

depth of embedment will be at least equal to the length of bolt in the hole, and usually more.

Where bolts are to be removable, we have (1) the inaccessible cavity where the anchor-bolt plate and nut are housed or (2) the accessible cavity. The bolt will, in both cases, be naturally separated from the nut by turning from above. The thing to provide for is to get the same or a duplicate bolt in threaded engagement with the nut later on. This ought to be a fairly simple matter to prearrange when a tunnel from the side is provided. For the inaccessible cavity, however, a good solution seems to be an anchor-bolt plate provided with an open chamber for the nut. This chamber and the nut may be so dimensioned that there is little or no play when the plate is once set in place. The nut need not be subject to a horizontal displacement of more than about ¼ in. when the anchor bolt is disengaged and withdrawn. The bolt can be returned and will find the hole in the nut if it is simply provided with a conical tip.

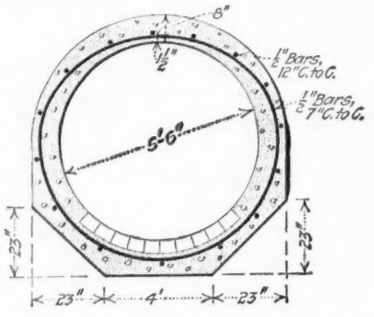


FIG. 6. CIRCULAR SEWER LINING

Concrete is exceedingly suitable for the purpose of providing anchorage for guy ropes, tie-back rods and the like. The resistance to the guy is ordinarily supplied by the weight of the block and of whatever may be loaded onto it. A simple method of getting the added resistance of a load is to bury the block under earth or rocks. Concrete made with crushed rock has a specific gravity of about 2¼, so that it will be easy to calculate the weight of an anchor block, remembering that water weighs 62½ lb. per cubic foot.

In constructing such a block it should be remembered that plain concrete is weak in tension. Consequently, we can hardly expect to develop the full resistance of a block if we simply anchor the guy in it after the manner used in securing an anchor bolt for a machine. There should be a branching out of steel connected with the anchor rods so as to involve the bulk of the block and not depend upon any tensile strength of the concrete.

A concrete lining for tunnels and passages is often employed where permanent construction is in view. Thus a main haulage road might well be a proper location for the use of concrete. A roof only may be what is wanted. This may be put in in the form of a semicircular arch, the concrete starting on one side at or below the level at which curvature begins and ending at or below the same level on the other side. The excavation for the arch will naturally be made deep enough to take care of a sufficient bulk. The reinforcement may be both longitudinal and transverse. In many cases it will be possible to make up lengths of the combination of both kinds of reinforcement and set them in place as excavation and concreting progress. It may seem best to carry the concreting down to the floor and thus provide side walls as well as an arched roof.

A center form of some description will be needed. This may consist of a framework of wood on which wooden lagging has been nailed. Such centers may be made in short lengths and used again and again. The material on which the ends of the arch test should be quite substantial, as the effect of using an arch is to concentrate and transfer the overhead load to this material. Where the arch is to terminate on the sides at about the level of the commencement and end of curvature, it has been recommended that the sides provided by nature be given a thin facing of concrete as a protection against weathering.

The position of the circular reinforcement has much to do with the strength of the arch. The top region of the arch is much like a cross-beam. The upper part is under compression while the lower part must bear tensional stresses. Consequently, the circular reinforcement should be located low at the top of the arch. On the sides it may be placed further from the center of curvature. At the level of the center of curvature the reinforcement may be set near the excavation surface. In consequence of the foregoing dispositions, the circular reinforcement will not be truly circular, but rather elliptical.

In the construction of circular concrete sewers and similar conduits it is approved practice to set the curved reinforcement elliptically. (See Fig. 6.) Above and below the center the reinforcement is close to the inner surface of the tube; on the sides it is near the outside surface. Where it seems advisable a steel form may be used. One or two patented systems of collapsible steel forms for just such work as arches are also available. In any case some method of preventing the adhesion of the concrete to the form will be necessary.

The placing of the concrete will at times require close attention. There is no great trouble in filling in the sides. If the form is too long to permit this to be done from the end, the arch lagging may be left off until the sides have been placed. In fact we may have set at one time only just the proper height of lagging to retain the amount of concrete then to be placed. It may be necessary, however, to secure the lagging to the ribs from the inside. The most difficult part of the work will doubtless be that of placing the concrete in, say, the top 60 deg. of the arch. If the mine has a compressed-air equipment, it may be advisable to get a pneumatic transmitter for placing tunnel concrete, especially that which goes into the crown of the arch. When a practicable type is employed the concrete may be piped from the transmitter to the point of use. Transmission may be effected around curves and up to levels

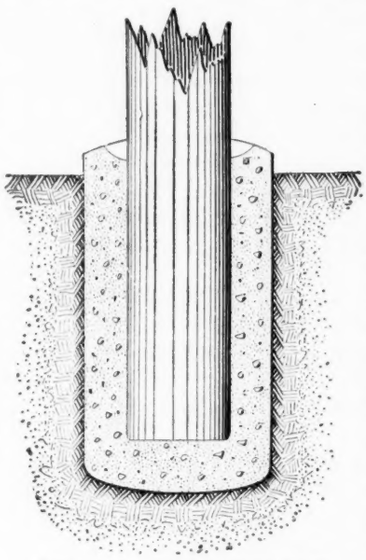


FIG. 7. A CONCRETE POST FOOTING

100 ft. above the transmitter. The pneumatic transmitting machines are not to be confused with sprayers.

As to the kind of reinforcement, steel bars are usually employed; but other material is, it appears, being used abroad. I wish neither to recommend nor discourage the use of strands of old wire rope. Prof. George Knox seems to be, if not an advocate of wire rope reinforcement, a countenancer of it, for he says: "The cheapest reinforcement for this kind of work is the strands of old steel haulage and winding ropes. Under normal conditions it may be only necessary to put the strands in longitudinally, but where extra support is required it is advantageous to have them crossed with transverse strands; and with very bad roof weights two sets of longitudinal and transverse strands may be put in together, with a few extra longitudinal wires between the sets. An important point to note in connection with the reinforcement is that the ends of the strands should terminate irregularly, so as to overlap the next set at different points and prevent anything in the nature of a 'joint' being formed."

The following formula is in effect the one recently recommended by Professor Knox for use where great strength is required: $1:1\frac{2}{3}:5\frac{2}{3}$. The coarse aggregate consists of granite in two sizes, $1\frac{1}{2}$ in. and $\frac{1}{2}$ in. I rewrite this formula, dividing the coarse aggregate in accordance with the amounts used and represented by two numbers connected by a plus sign. The first of the two numbers represents the smaller aggregate. The rewritten formula is: $1:1\frac{2}{3}:2\frac{2}{3}+3$.

If the underground roadway is dry, the following formula is given as permissible: $1+8:0:24$. This is to be interpreted as follows: There is, first of all, 1 part of cement; to this are added 8 parts of freshly burned lime; no sand as such is employed; there are 24 parts of hard shale (from ripping), varying in size up to $1\frac{1}{2}$ in. There will doubtless be in the shale a percentage of an equivalent of sand.

The wooden pole is used in many places in or around coal mines. I am not now speaking of props. Such poles, whether employed as supports for lighting fixtures, electric wires or for some other permanent use, are apt to rot at the base. Moisture and fungi are said to be "the two prolific causes of decay and shortened pole life." The plain cementing of the base of the pole seems to have been tested out and found inadequate. The failure to prevent bad effects seems to be attributed to the insufficiency of the joint between the pole and the inner surface of the cement coating.

It is conjectured that water gets into the joint and remains there. It is understood that some poles with cemented bases set in soils which permit the escape of water really rot faster than others set in what appear to be bad soils. The trapping of water inside the cement shell would appear to explain this. Water is not necessarily an enemy of wood. If a piece of wood is perpetually submerged in water having no chemical action, its life will probably be excessively long. It is the change from wet to dry and back again that seems to work the damage.

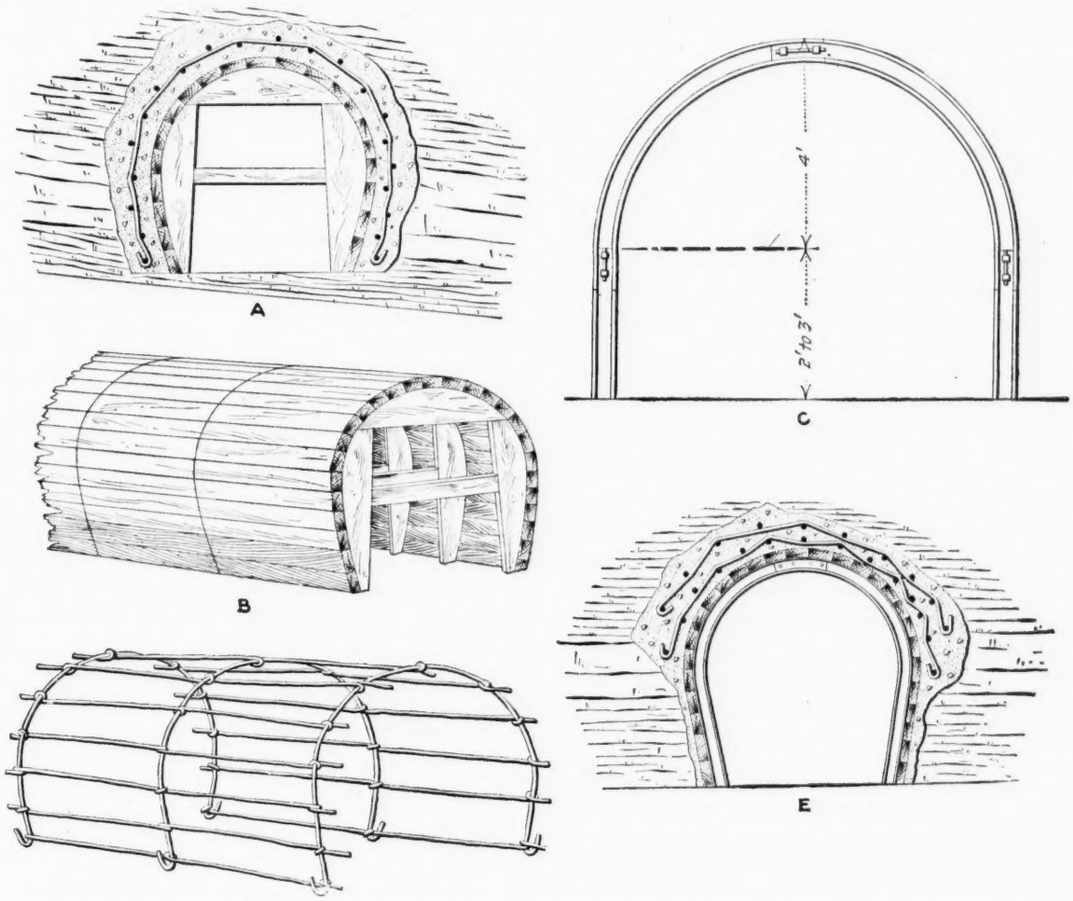


FIG. 8. ARRANGEMENT OF REINFORCEMENT AND ARCH CENTERS FOR TUNNEL LININGS

It has been proposed to use a tar seal to prevent the entrance of moisture into the space between the concrete cup in which the pole stands and the pole itself. That is to say, the concrete is poured in the usual way to make an envelope all around the base of the pole and beneath it. The top of the cup may be brought up a little above the general surface and rounded. When this concrete is still soft, a gutter may be cut out all around the top next the pole. Hot tar is poured into this annular depression and forms a seal against moisture. (See Fig. 7.) This may be expected to be effective until the pole cracks. The crevices in the wood now form new avenues for the entrance of water. These may be stopped up with tar and the seal again made effective.

Concrete-lined pits are often used as containers or reservoirs. Such pits have been constructed of large size for the purposes of retaining house water and also coal in wet storage. A sloping side is a convenient design. The floor may be level; or, if drainage is desired, approximately so. Compact sand having no tendency to flow forms a good foundation. Clay should be investigated before being rated as all right. The amount of concrete can often be reduced markedly by using steel reinforcement. Steel bars supplemented with wire mesh are usually most suitable. If it is desired to make the shell impervious this may be approximately done by providing a rich, dense layer of concrete for the inner lining, while the remainder of the shell may be constructed of a more economical concrete. However, if the pit stands in water and the head has any substantial value, the complete emptying of the pit may be accompanied by the breaking away of this inside lining. This is a chance that may sometimes have to be taken.

The steam spraying system is adapted to putting on a dense layer. As to the pneumatic sprayer, I do not know. The layer may consist of a rich, cement mortar, 1:2 or 1:1½; or a pebble concrete, the coarse aggregate being rounded pebbles of small size. Some such formula as 1:2:2 may be followed. There are various waterproofing compounds which may be incorporated with the concrete, but I cannot give a thoroughly reliable word as to their efficiency. If it is desired to make the pit absolutely impervious to water from the outside, a brick and mastic combination may be used for the outer shell.

If the floor area, considered in connection with the extensions up the oblique walls, has a length or a breadth in excess of, say, 40 ft., it will be advisable, generally, to use expansion joints. These may run both lengthwise and transversely.

Vancouver Island Production in June

The Vancouver Island collieries produced 137,895 gross tons of coal for the month of June, a little over 5000 tons less than the quantity produced in the month of May. The tonnage produced by the various companies was as follows:

	Tons
Canadian Western Fuel Co., Nanaimo colliery	61,685
Canadian Collieries (D) Ltd., Comox colliery	47,926
Canadian Collieries (D) Ltd., Extension colliery	18,367
Pacific Coast Coal Mines, Ltd., South Wellington	8,417
Nanoose Collieries, Ltd., Nanoose colliery	1,500
Total	137,895

For the first six months of the year the Vancouver Island collieries produced 857,131 tons, a decrease of 24,881 tons as compared with the same period last year. The producing mines are three less than was the case in 1917—namely, the Jingle Pot mine, South Wellington mine, Pacific Coast Coal Mines, Ltd.: and No. 4 mine, Canadian Collieries (D), Ltd., Extension colliery. The Jingle Pot mine alone produced 48,885 tons during the first six months of last year, so that in spite of the loss in tonnage from this mine and the others since closed down the tonnage has been well maintained.

The tonnage produced by the various companies for the first six months follows:

	Tons
Canadian Western Fuel Co., Nanaimo colliery	389,984
Canadian Collieries (D) Ltd., Comox colliery	280,151
Canadian Collieries (D) Ltd., Extension colliery	118,148
Pacific Coast Coal Mines, Ltd., South Wellington	51,181
Nanoose Collieries, Ltd., Nanoose colliery	17,667
Total	857,131

The Canadian Western Fuel Co., at its Nanaimo colliery, has made a gain of 63,515 tons for the first six months of the year. The Canadian Collieries (D), Ltd., at its Comox colliery, has made a gain of 21,233 tons thus far, but has lost 32,014 tons at its Extension colliery. This is accounted for by the closing down of No. 4 Mine as previously mentioned. The Pacific Coast Coal Mines has a loss in output of 36,816 tons for the first half of the year. This is explained by the abandonment of the South Wellington mine.

The Nanoose collieries has made a gain of 9086 tons, while the Jingle Pot mine of the Vancouver Nanaimo Coal Co., as stated, has produced no coal this year while for the first half of 1917 its output was 48,885 tons. The No. 5 mine of the Canadian collieries is not producing about 100 tons daily from development work.

The new mine at Cassidy's Siding, Esquimalt & Nanaimo Ry., which is being opened by the Granby Consolidated Mining and Smelting Co., is now producing coal from the development work. Some 1000 tons has been dumped at the surface of the mine but no shipments have been made as yet. The Island tonnage should be somewhat augmented by the production of this colliery before the end of the year.

A pair of shafts are now being sunk for the purpose of opening up a new mine on the company's farm near Nanaimo by the Canadian Western Fuel Co., and coal will probably be reached by October of this year and shipments made before the end of the year.

The coal produced by the mines of the Nicola-Princeton District for the first six months of the present year was 19,972 tons in excess of that produced in the same time in 1917. The tonnage to the credit of the several companies the first six months of 1918 follows:

	Tons
Middlesboro collieries	54,698
The Fleming Coal Co.	12,637
Princeton Collieries, Ltd.	22,148
Total	89,483

The Middlesboro collieries has made a gain of 19,152 tons over last year and the Fleming Coal Co. (formerly the Inland Coal and Coke Co.) has exceeded last year's showing for the same period by 5198 tons. The Princeton collieries has made a gain of 355 tons. The Merritt collieries has not been operating this year, while last year for the first six months its output was 4782 tons. Despite this handicap the district shows an increase of 19,152 tons.

Lubrication of Air Compressors

By W. H. CALLAN
Chicago, Ill.

SYNOPSIS — *Oil salesmen seem to believe that a heavy oil is necessary to the efficient lubrication of air-compressor cylinders. Practical experience would indicate, however, that a fairly light oil might be used with entire success.*

THE lubrication of the air compressor, steam cylinder, main bearings, crankpin, crosshead pin, crosshead guide, etc., does not differ from that of the ordinary steam engine. The means and methods employed are well known and understood; hence the discussion in this article will be confined to that of air cylinder lubrication only.

A number of years ago, when the compressor business was young, considerable trouble was experienced in procuring a suitable oil for lubricating the air cylinders of compressors. After considering the matter for some time, it was decided by the company by which I was employed that an expert on the subject should be consulted. Accordingly, the matter was taken up with a well-known oil company, whose representative called upon us and, after making a careful examination of the conditions, reported that the trouble was entirely due to using an oil of too light body and too low viscosity to withstand the high heat of the compression. He stated that the oil used was gasified, due to the high temperature of the air, and that it passed off in vapor, leaving the cylinder wall without lubrication. The expert thereupon recommended an oil which he considered suitable for our use. The particular grade happened to be of 26 Beaumé gravity with a flash point of 515 deg. F., a fire test of 555 deg. F., and a viscosity of 130 S at 212 deg. F.

No Increased Efficiency Was Secured

After using this oil for some time, we found no improvement in the operation of the machine; in fact, it appeared to be laboring and the temperature of the discharge air was high. After several days of operation with this new oil, the cylinder heads were removed, the valves taken out and a careful examination made. The cylinder wall seemed to have a sticky, plastic coating; the air passages and discharge cavity of the cylinder showed signs of dark deposits, while the faces of the valve seats were covered with a black, hard coating. This hard formation on one side of the valve seat caused the valves to leak, hence the increased temperature of the discharge air. The sticky coating on the wall of the cylinder was responsible for the increased friction.

The respresentative's attention was called to this condition, whereupon he suggested that a little lighter oil be used. This time he recommended one with 27½ Beaumé gravity, a flash point 450 deg. F., a burning point of 500 deg. F., and a viscosity of about 125 S at 212 deg. F. We asked him if he did not think this was a little too heavy a grade for air-cylinder lubrication. He assured us it was not, and stated that, in order to withstand the high temperature of the compressed air, it was necessary to have a rather low gravity and high viscosity oil, with a flash point above the temperature of the air.

After we had used this grade of oil for some weeks, a further examination was made; and while the cylinder wall appeared considerably better, the valve passages and discharge cavities of the cylinder were badly coated with a hard deposit. When this matter was again brought to the attention of the expert, he suggested that we reduce the amount fed into the cylinder. This was done with great care until we were only using three drops a minute in a 14 x 14-in. cylinder running at 150 r.p.m. But even under these conditions the deposits in the valve passages and the discharge cavities of the cylinder continued to form as long as this oil was employed.

The expert happened to come our way several months afterward, and I called his attention to the condition experienced with his oil. In regard to the amount we were feeding into this cylinder, he said this was reduced to a point that he thought was the minimum. His reason given for the formation in the passages was that the residuum of all oils is carbon, and that it therefore was no doubt due to carbon deposits. At the same time he assured us that the oil he had recommended was the best procurable for the purpose, and that we should go ahead and use it without any fear.

Deposit Built Up Rapidly

This was done, but the formation in the discharge passages seemed to be building up rapidly despite the fact that only a small quantity of oil was being fed into the cylinder. These formations finally collected to such an extent that it was necessary to clean the passages in order to avoid the hazard of an explosion. The passages were accordingly cleaned, and some of the material removed was analyzed and found to contain about 1.5 per cent. free oil, 11 per cent. rust, 5 per cent. decomposed oil, 30 per cent. mineral ash, 10 per cent. coal dust, while the remainder was foreign matter, or residuum. A further investigation revealed the fact that our intake was exposed to such material as coal dust, mineral ash, shavings, water, etc., as well as some air.

After cleaning the compressor, and safeguarding the intake against dirt and dust, we procured another grade of oil which in our own judgment was more suitable for the work, since in the meantime we had made investigations and studied the question to some extent. This time we procured an oil of 31 Beaumé gravity, a flash point 375 deg. F., a burning point 420 deg. F., and a viscosity of 200 S at 100 deg. F. We started by feeding three drops per minute. Finding the cylinder copiously oiled, we reduced the feed to two drops a minute. The compressor was operated in this condition for a considerable length of time with practically no trouble from carbon deposits.

Experiencing such good results from this light oil, and by this time disbelieving in many of the virtues claimed for low gravity, high flash point and heavy viscosity, we were prompted to try another grade of oil, selecting this time one having a gravity of 33 Beaumé, a flash point of 380 deg. F., a fire test of 420 deg. F., with a viscosity of 140 S at 100 deg. F. We used the same quantity as before—namely, two drops per minute in a 14 x 14-in. cylinder running 150 r.p.m. This oil was used for years without any trouble from lubrication, valve leakage or carbon deposits.

The oil representative made his regular calls on us, and each time we told him what we were doing; but he assured us we were on the wrong track and that sooner or later would get into trouble. After continued tests, however, and careful observation of all conditions, we became satisfied that the latter oil is the most suitable for air-cylinder lubrication when working against a 100-lb. pressure, with either single- or two-stage compression.

An Old Friend Calls

One day an old friend of mine called, who also happened to be an expert representing one of the leading oil companies. I related to him my experience with air-cylinder lubrication and, somewhat to my surprise, he too assured me that we were using the wrong oil and said, "You know you get not less than 400 deg. C. F. in your air cylinder when working against 100 lb., single stage." With this I agreed. I then asked him how he knew we were wrong, and what means he employed for ascertaining the proper grade of oil for air-cylinder lubrication. He then proceeded to explain the method his company's engineers use in determining the proper oil for different kinds of service.

He explained this in part:

You have agreed that the temperature of the air is 400 deg. Our test would be conducted as follows: Take a block of cast iron 6 or 8 in. square and 2 in. thick, place this block on a layer of sand in a shallow iron pan and pack the sand closely around the cast-iron block, then put a gas burner under the pan and turn on the heat slowly. The top surface of this block is polished and is provided with a drilled hole into which a thermometer is inserted. Heavy steam-cylinder oil is poured into the hole around the thermometer bulb so as to make a close heat contact. When the thermometer rises to 400 deg., lower your gas burner until the thermometer remains steady at this temperature. Then take your different samples, dip the point of a lead pencil into the oil, hold the pencil 2 in. from the surface of this iron block and allow a drop to fall on the hot polished surface.

When such a test is made with the grade of oil from which you say you are getting successful results, we find the drop spreads out to about 1⅛ in. in diameter, smokes a little, dries up, and is evaporated in ten seconds time, leaving the surface perfectly dry. With a higher grade of oil having a flash point of 450 deg. F. and heavy viscosity, when the drop falls on the surface of this polished block it spreads out to about 1¼ in. in diameter, smokes a little, but after five minutes the surface is still oily. Thus we have proof that this is the proper oil to withstand such service as you get in your air-compressor cylinder.

Then I asked him what he thought the temperature of the surface of the cylinder wall was when the air in the cylinder was at 400 deg. F. He hesitated a little, then said he believed it would be about 25 deg. F. less than the temperature of the air. I disagreed with him here, saying this did not seen right, as the water-jacketed wall should be much cooler than the air. After some discussion we went into the office and consulted some authorities on the subject; we found some tests had been made abroad on the temperature of the cylinder walls in an internal combustion engine, where, with an explosion temperature of 2700 deg. F. and an average temperature through the cycle of 950 deg. F., and the water in the jacket at 200 deg. F., the inside surface of the cylinder wall did not go above 267 deg. F.

When my friend was shown these figures he was nearly speechless, and admitted that he had never thought that the temperature of the wall of an internal combustion engine cylinder, with an explosion temperature so high, could remain as cool as this authority stated. However, since the character of the authority was such that it could not be questioned, it was accepted by the oil expert. I then asked what he thought the temperature of the air cylinder wall should be when the air does not exceed 400 deg. F., in answer to which he said he did not know, but did not believe it would be much above the temperature of the water in the jacket.

As a matter of fact, the temperature of the inside of a water-jacketed cylinder wall is not more than 30 deg. F. higher than the temperature of the jacket water, as long as the water does not boil; and, since this is the true condition, what is the use in employing oils of low gravity, high fire test and high viscosity to meet a condition such as this? The temperature of the inside surface of the cylinder wall on an air compressor is little, if any, above the temperature of the surface in the main bearing of the ordinary Corliss engine.

High Viscosity Is Not Essential

From this it appears that the ordinary oil expert who lays much stress on high viscosity and high flash point has not considered the true conditions. Furthermore, it has been shown in this article that the cause of carbon deposits in the passages of an air cylinder is not always entirely chargeable to the residuum of oil, but in many instances is due to using a lubricant of too heavy a body, which adheres to the passages of the cylinder. Also, when the inlet is not properly protected from foreign matter, all such material as coal dust, fine ashes, shavings, waste, etc., is drawn into the cylinder and deposited on the sticky surfaces coated with this heavy oil. This foreign matter, with additional oil, gradually builds up until the passages become choked. The air valves now begin to leak for some reason, thus increasing the temperature, until finally this sometimes reaches a point as high as 500 deg. F. when compressing to 100 lb. single stage. If there are many shavings or much coal dust deposited in the passages, this is apt to char and become incandescent. When this takes place the temperature of the air rises rapidly, and as a consequence the pressure increases quickly to a point beyond the strength of the receiver, and results in what is generally called an explosion.

It is my opinion that no violent explosion ever takes place in the ordinary air compressor, unless kerosene, gasoline or some such material is introduced into the compression space.

In my personal experience some years ago with a two-stage compressor where the intake had been neglected and also the wrong grade and quantity of

oil had been used, the high-pressure discharge valves became leaky, thus allowing the air to churn in and out of the cylinder at each stroke, and heating it until it became so hot that the heavy deposits in the passages actually took fire; the whole system burned out, like a chimney from an old-time wood stove. Fortunately, however, there was no explosion because the safety valve on the receiver relieved the sudden pressure caused by the burning material in the discharge passages and the compressor was promptly shut down.

From the foregoing it will be understood that in the selection of an oil for air-cylinder lubrication, nothing should be used but a pure mineral product having a gravity of from 31 to 33 Beaumé, a flash point of 375 to 390 deg. F., and a viscosity of 140 to 150 S at 100 deg. F. Under no circumstances should a heavy grade be used, despite whatever claims may be made by the oil salesmen as to the virtues of heavy viscosities or high flash points. It should also be borne in mind that when the surface of the cylinder wall is once glazed over, little oil is required to properly and adequately lubricate the working surfaces.

Too Much Oil Forms Carbon Deposit

The film of oil on the cylinder wall is understood to be less than 0.00025 in. in thickness. The piston rides back and forth on this film, which requires little oil to be added in order to maintain the necessary quantity. Should a greater amount of oil be used than just enough to keep up the required film, it will be plowed up ahead of the piston and be forced through the valves and into the cylinder cavities, where it will collect in the low places and solidify by reason of being mixed with foreign matter taken in through the inlet. This forms deposits commonly called carbon.

As has been shown, a 14 x 14-in. cylinder can be adequately lubricated with two drops of oil per minute when the compressor is operated at 150 r.p.m. This is the equivalent of one drop of oil for each 800 sq. ft. of cylinder surface swept by the piston. The oil herein referred to happened to be made from a paraffin base petroleum. However, it is believed that an oil of about the same consistency, refined from an asphalt base natural oil, would serve as well, if not better.

Soft Coal Exports in May

Exports of bituminous coal in May of this year increased markedly over those of the corresponding month of last year. In the table following the revised figures covering the exports for May, 1917, are given for purposes of comparison. The returns to the Department of Commerce are as follows:

COAL EXPORTS FOR MAY, 1917, AND MAY, 1918

	May, 1917	May, 1918
Anthracite, tons	429,137	425,110
Bituminous, tons*	1,830,439	2,119,700
Exported to (in part):		
Italy, tons	41,139	.....
Canada, tons	1,401,158	1,766,785
Panama, tons	45,111	50,108
Mexico, tons	12,484	14,181
Cuba, tons	153,750	137,048
Other West Indies	37,282	25,717
Argentina	23,888	14,750
Brazil	44,281	79,400
Uruguay	1,329	4,529
Other countries	70,017	27,182
Coke	134,091	146,740

*Does not include fuel or bunker coal laden on vessels engaged in foreign trade, which aggregated during May, 1917, 629,010 tons and during May, 1918, 425,796 tons.

Minecdotes

The Tendency of the Times

When coal mines first started to electrify their power equipment, the coal operator was practically at the mercy of the equipment salesman. The result was that some mines are a veritable museum of all the kinds of electrical equipment ever built. Today, however, the average coal operator is well versed in matters pertaining to electrical equipment, and a salesman must be equipped with more than the usual line of hot air to obtain any consideration.

An amusing but instructive incident took place a short time ago at a meeting of salesmen and engineers representing several manufacturers of electrical equipment. The object of the meeting was to establish, if possible, some standard ratings as regards speed and capacity of mine equipment. A salesman from one company suggested a questionable method of rating the capacity and speed of mine locomotives, stating that there could be no objection to the method since the customer had no way of making a check. An engineer from one of the other companies immediately jumped to his feet and, pounding his fist on the table, said in forcible language, "Gentlemen, the time has past when you can stick your finger in the customer's eye and when the tears roll down his face make him believe it is raining."

Legal Department

Notice of Condition Imputed to Employee—A mine employee who had passed through an entry 66 times in 11 days must be presumed to have known the fact that the entry was too small to enable him to alight from a car therein, as affecting liability for injury occurring to him while driving an ungentle mule through the entry. (Kentucky Court of Appeals, Mahan Jellico Coal Co. vs. Bird, 201 Southwestern Reporter, 306.)

Authority of Coal Company's General Manager—Holding that the operations of coal-mining companies are such that the general manager of such a corporation may be deemed to have implied authority to contract for the sale of the entire output of his company for a given year, the West Virginia Supreme Court of Appeals said recently in the case of Producers' Coal Co. vs. Mifflin Coal Mining Co., 95 Southeastern Reporter, 948: "A corporation acts only by and through its officers and agents, and Deal was an agent of defendant, held out by it to the public, by virtue of his position, as representing it in the general management of its business, one important feature of which was the sale of the product of its coal mine. Coal-producing companies do not store their coal, but usually sell it before it is mined, and to be delivered at a future time. * * * The general manager of a corporation has authority to bind it by such contracts as are reasonably incident to the management of the business intrusted to him. It was therefore not incumbent upon plaintiff to prove that Deal was expressly authorized to make the contract sued on, in order to hold the defendant liable. His apparent authority, as general manager of its business, to make the contract was sufficient ground to create liability."

Coal, Explosives, War—II

By H. J. BROUGHTON
Wilmington, Del.

SYNOPSIS—Various methods may be employed for exploding powder or other explosive in boreholes for which both the electric squib and electric primer are entirely satisfactory. Proper placing of shot holes, adequate and careful tamping and prompt detonation are as essential to the best results as is the quality of the explosive.

IN USE, blasting powder is exploded by a spark from fuse, electric squib or miner's squib, or by a primer of some high explosive, the last being employed only in heavy charges on open work. In mining, and sometimes in light charges on open work, blasting powder is made into cartridges by means of a paper tube or cylinder sealed at one end, which is known as a tamping bag. Sometimes the paper cylinder is made by the miner, by coiling a section of heavy paper, known as blasting paper, around a wooden pin, called a cartridge pin, and securing it with what is called blasting soap. The removal of the pin leaves a cylindrical cartridge open at one end, into which the powder is poured, the top being then folded and sealed with blasting soap.

The cartridge form increases safety by eliminating loose powder about the borehole, protects the blasting powder from moisture when in the hole, and makes the charging much easier and quicker.

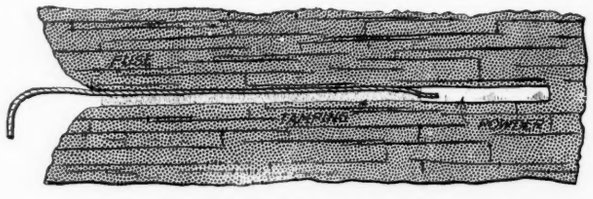
The cartridge pin should be but little smaller in diameter than the borehole so that the cartridges will fit snugly therein without appreciable air space around them. The air space is usually objectionable because it tends to reduce the breaking effect and the results given by the explosive. It is not advisable to make the cartridges longer than 18 in., because they are then heavy and bulky and likely to break or become unsealed in handling. Any length that may be required less than 18 in. can readily be made. One or more cartridges may be used in each borehole.

Best Method of Exploding Cartridges

The best way to explode blasting-powder cartridges is with an electric squib or with a high explosive primer. The latter should not be used in coal mines. Other methods are with fuse, miner's squib, electric blasting cap or delay electric igniter. The electric blasting cap is an efficient blasting-powder exploder, but is no better than the electric squib, which costs less, although when a high explosive primer is employed to explode large charges of blasting powder an electric blasting cap is necessary.

The advantages of the high explosive primer detonated by an electric blasting cap are that it can be lowered into a deep hole and properly placed in the charge more easily than an electric squib, electric blasting cap or blasting cap and fuse; that the flame given off and the heat generated by the detonation of the high explosive primer cause the blasting-powder charge to explode more quickly and therefore to do more work, and that the explosion can be started in the middle of the blasting-powder charge. A blasting cap or fuse may be used for detonating the high explosive primer, but where this is done the advantage gained by placing the primer in the center of the powder charge is lost, because the "side spit" from the fuse almost invariably ignites the blasting powder before the fuse has burned to the blasting cap in the high explosive primer. These are the same difficulties that occur when the blasting-powder charge is exploded by a fuse or squib from the outer end.

In the use of fuse or miner's squibs, the charge cannot be first ignited in the middle. When the explosion of a charge of blasting powder in a borehole commences at the outer end, the gases evolved by the first portion of the powder exploding blow away the resistance, so that the latter part of the charge practically burns in the open and much of its value in breaking the surrounding material is lost. Also, when a long charge begins to explode at one end, the shock of the first part of the explosion may break the outer part of the powder entirely. Or again, the explosion of one end of

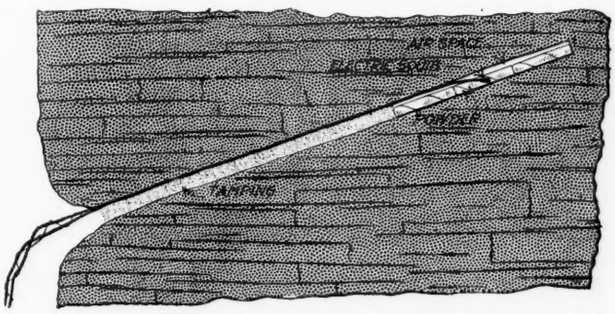


A LOADED HOLE PRIMED WITH A FUSE

the charge before the other may result in throwing partly exploded and burning powder into the open air in places where it might cause disastrous results. It must be understood that the time required for the explosion to travel from one end to the other of even a long charge of blasting powder is short indeed, but a much longer period is required than for the detonation of a high explosive to travel the same distance, and takes enough time to cause the results already described.

Other advantages in the use of the electric squib or the electric blasting cap, either with or without a dynamite primer, are the elimination of smoke from burning fuse and the ability to explode a number of charges simultaneously, which results in greater execution. Furthermore, the shotfirer has absolute control of the time when the shot explodes, making it possible to fire when everybody is in a safe place, thus eliminating the danger resulting from persons inadvertently entering a chamber after a slow-burning fuse has been lighted. Still another advantage in electrical ignition of blasting-powder charges is that the possibility of misfire is reduced to a minimum and that of hangfire entirely eliminated. Misfires, hangfires, and quickfires occur not infrequently with the use of fuse or miner's squibs. Hangfires have probably caused as many accidents as anything else connected with the use of explosives.

When the electric squib is used to explode blasting-powder charges in cartridges, the paper shell already referred to is filled half full of powder, the electric squib put in, and then the remainder of the shell is filled with powder above the electric squib and about the



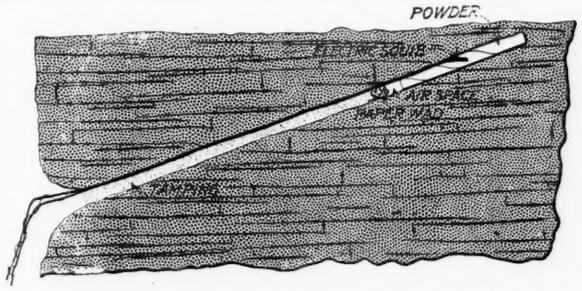
LOADED HOLE WITH AIR SPACE AROUND CHARGE

wires. Enough empty shell is left at the top to tie securely about the wires. The cartridge is primed in this manner, and if the charge is to consist of more than one cartridge, this one, known as the primer, is placed at or near the center of the charge.

When exploding bulk charges of blasting powder chambered in boreholes on open work with electric squibs, the squib should be lowered into the borehole after half of the charge has been poured in. The remainder of the charge is then poured on top of it.

To lower the squib into the borehole, a blasting-powder cartridge should be used or a short stick of heavy wood tied to the wires just above the cap. This will supply the weight necessary to lower the squib easily to the bottom of the borehole. Metal or stone or anything else that could strike a spark should not be used for this purpose.

Pushing the electric squib into the borehole with the tamping stick, by spreading the wires just above the cap and catching the loop thus made on the end of the tamping stick while the wires are held taut, should never be resorted to. The objections to this are that the pressure on the wires necessary to hold the electric squib in place is quite likely to break them apart in the cap; the probability of destroying the cap by striking the end of the tamping stick against some projection on the sides of a borehole, made irregular by springing, and the difficulty of withdrawing the tamping



LOADED HOLE WITH AIR SPACE IN FRONT OF CHARGE

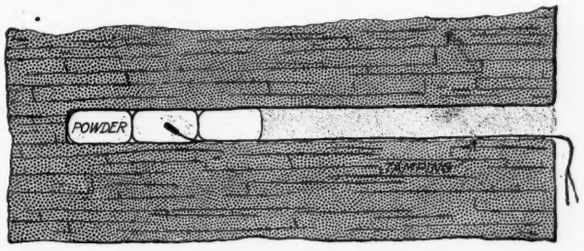
stick and leaving the electric squib in proper position in the charge.

An easy way to prime a charge of blasting powder in bulk is to make a blasting-powder cartridge primer with electric squib, as already described for blasting in mines, then lower this primer into the bulk charge of blasting powder. This primer, being heavy, can be readily lowered into place without aid from a weight or the tamping stick in the same manner as that employed with a high explosive primer. If a primer consisting of high explosives and an electric blasting cap be used for exploding a charge of blasting powder in bulk, it also should be located somewhere near the center of the charge.

When fuse is employed for igniting charges of blasting powder in cartridges, it should be tied into the cartridge just as the electric squib is, but it is not necessary to have it extend more than a couple of inches into the powder. If the charge consists of more than one cartridge, the one containing the fuse should be loaded last. The best way to prime a charge of blasting powder in bulk, with fuse, is to tie the fuse into a cartridge and lower it onto the charge.

The miner's squib is employed only in mine blasting and when the charge is in cartridge form. Although the blasting-powder charge is not truly primed with it, the miner's squib is the means of igniting the charge. Accordingly the method of using it will be here described.

When using the miner's squib, the copper-tipped or brass miner's needle is pushed 2 or 3 in. into the end of the blasting-powder cartridge or the outside one, if the charge consists of two or more. The cartridge is then put into the borehole with the point of the miner's



EXPLOSIVE CHARGES SHOULD BE IGNITED AT OR NEAR CENTER

needle remaining in it and the other end of the needle extending from the mouth of the hole, the needle having first been carefully coated with soap. Tamping is then packed tightly about the needle from the charge to the mouth of the borehole.

Careful removal of the needle leaves a hole about ¼ in. in diameter from the mouth of the borehole into the powder. In this hole the miner's squib is laid, with the "slow match" end extending. This is lighted, and when the fire burns to the powder train in the squib, the squib shoots like a rocket back through the needle hole into the powder and explodes the charge.

The miner's squib method of exploding blasting powder charges is the cheapest, so far as first cost is concerned. Besides having the disadvantage of starting the explosion at the end of the charge, like fuse, it is probably the most uncertain method in its result, because if the needle is carelessly removed the hole in the tamping may close up in places and prevent the miner's squib from shooting into the blasting powder.

In order to prevent this, a piece of ½-in. gas pipe, called a blasting barrel, is sometimes used instead of the miner's needle. One end of this is embedded in the end of the outside powder cartridge, while the other end extends from the mouth of the borehole, and the

tamping is packed around it just as when the needle is employed. The blasting barrel is not withdrawn, however, and the squib shoots back to the powder through it, the blasting barrel being thrown out with the material blasted when the explosion takes place. It is then recovered, and sometimes is used a number of times before it is destroyed. This is a much more certain method than the use of the miner's needle, but is almost, if not quite, as expensive as the use of fuse. This, however, depends on the number of shots the blasting powder will withstand.

As a general rule, it is necessary to press the charge compactly into the back or bottom of the borehole and to tamp tightly above it to the mouth of the hole, if the maximum efficiency of the explosive is to be developed. Sometimes, however, in easily shattered coal or other material, greater execution will result if an air space remains around the powder charge, or preferably between the last cartridge loaded and the tamping. The former is accomplished by making the cartridge shells on a pin materially smaller in diameter than the borehole, and not pressing the cartridges so hard in the back of the borehole that the shells will be crushed or break.

How to Provide the Air Space

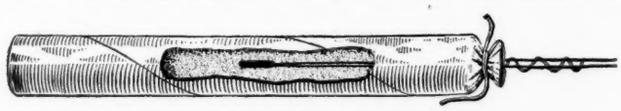
The air space between the charge and the tamping is provided by pushing a wad of paper back to within several inches of the charge, and then filling outside or above this with tamping material, first pressed lightly in order not to push the paper wad any closer to the explosive. When the explosion takes place the air space back of the tamping acts as an elastic cushion, causing that part of the force of the explosion, which is first exerted forward or upward along the line of the borehole, to rebound and expend itself, to a considerable degree, laterally. This sometimes results in sufficient side-spreading of the explosive force to bring out a great quantity of coal or stone in large lumps, when, without the air space, the charge would expend the major portion of its energy forward or upward along the line to the face or surface, resulting only in blowing out a comparative small quantity. This method of blasting applies principally to coal mining, where it is known as an "air shot."

Charges of all blasting explosives must be closely confined to be effective. This applies particularly to blasting powder, because on ignition it changes from a solid into a gaseous state slowly as compared with most other blasting explosives. It can be easily understood that if there be one or two places in the material confining the charge that are materially weaker than all of the rest, such, for example, as insufficient tamping in the borehole, the gases formed by the rapidly burning powder will blow out through the weak spots, often projecting large quantities of flame with them. "Blow-out" and "windy" shots in coal mines are examples of insufficient resistance to the charge of blasting powder, due to shots being badly located because they are improperly balanced in resistance.

These arise from overcharges of powder when the resistance in several directions is not great enough, and to insufficient tamping, which permits a large part of the force of the explosion to waste itself through the borehole. As the gases given off by a partly tamped charge are much more poisonous than those from a thoroughly tamped one, the desirability of filling the hole to the face with tightly packed material can be readily understood.

The best tamping material is damp clay, free from pieces of stone. Sharp scraps of stone in the tamping are likely to cut or abrade the fuse or the insulation of the electric squib or the electric blasting-cap wires. Coal dust is poor tamping, not only because the heat generated by the explosion burns it, but also because it does not pack well. Tamping bags are recommended as containers for the tamping used in all horizontal or pitching boreholes and in "uppers." It is practically impossible to tamp uppers and difficult and inconvenient to tamp horizontal or pitching boreholes without containers for the tamping. If regular tamping bags are not at hand, cylinders for this purpose should be made out of paper, like those used when making the powder into cartridges.

For pressing the tamping into the borehole a tamping stick is used. This is a straight rod of hard wood, a little smaller in diameter and a few feet longer than the borehole. There must be no metal whatever about it. It is absolutely unsafe to use a drill or any metal bar



PROPER PLACING OF ELECTRIC SQUIB

to tamp any explosive. This is particularly true if the explosive be blasting powder. When metal comes forcibly in contact with rock, or even with sand or any other very hard substance, it may strike a spark, which would easily ignite any grains of blasting powder that it might fall upon. Loose grains of blasting powder are often distributed along even those boreholes in which the powder charge is in cartridges, although an attempt may have been made to fold down and seal the ends of the cartridge shells. A few grains of powder would quickly carry the explosion from the grain accidentally ignited by a spark to the charge proper.

Dangerous to Use Metal in Tamping

In vertical boreholes through rock which have been chambered, the walls are nearly always more or less ragged and seamed, with ledges and points. When the borehole is charged the powder lodges on these, and even a wooden tamping stick must be used carefully to avoid knocking together two pieces of hard rock with sufficient force to throw a small spark into the powder. For tamping in this work it is exceedingly dangerous to use a metal bar, a pipe with wooden plug in the end, a wooden stick spliced with nails, wire or tin or anything that has any metal whatever about it.

The first 3 or 4 in. of tamping should be dry and pushed gently against the powder. The remainder ought to be packed in with as much force as can be given to the tamping stick used by hand, but particular care must be taken not to kink, cut or abrade the fuse or the wires of the electric squibs or electric blasting caps. When the tamping is not packed tightly to the mouth of the borehole a part of the force of the blasting powder is wasted. The electric squib wires, electric blasting-cap wires or the fuse must always be long enough to extend well out of the mouth of the borehole.

(To be concluded)

Testing for Gas in Mines

By H. E. GRAY
Confluence, Penn.

SYNOPSIS—*Crude practice of firebosses, in testing for gas in mines. Choice of a suitable lamp for testing. Important features and requirements. Principle of all safety lamps. The lamp flame, its formation, size and quality. Flame caps; the "fuel or oil cap" often mistaken for a gas cap when the lamp burns a volatile oil. The "Sight Indicator" for reading percentage of gas present avoids guesswork and brings all firebosses' reports to the same base of measurement, which is important in testing and reporting gas.*

MANY men have given their time and attention to ideas, schemes and suggestions from which might be formulated some fixed method or plan to guide the fireboss or mine examiner in doing his work, enabling him to obtain positive results and eliminate the fatal guesswork in determining the gaseous condition of the mine air.

In his splendid work on "Mine Gases and Explosions," J. T. Beard says, in describing the method of measuring gas in the mine, page 345, "Strange as it may seem, the common practice of determining and reporting the quantity of gas found in a chamber is even more crude than the method of its detection."

It is evident to all acquainted with the work that the methods commonly used in mines to-day, for testing gas, are strangely in keeping with the rule of "By guess and by gosh." *By guess*, you are right; but *by gosh*, you are wrong. If we would avoid the pitfalls of the past and cut out all guesswork in gas testing, we should begin by selecting a suitable lamp.

The lamp must be constructed on principles that will enable a fireboss to make a satisfactory test for gas, under the varying conditions existing in mines. Whether the mixture is explosive or inexplosive, one must be able to make the test safely and withdraw his lamp without losing his light. The extinction of the lamp would seriously interfere with the completion of the work within the time allowed by law.

While other firebosses may prefer lamps of different types, my choice is a lamp of the Marsaut pattern. In order to secure a steady fixed flame, it is important that all inside dimensions shall be such as to avoid any offset or projection on the inner surface of the lamp chimney. The lamp must be bonneted so as to strengthen the motive column formed within the chimney, as that will greatly improve its illuminating power, which is an important feature in the work of examining a mine.

To the student of mining, the term "safety lamp" is misleading, and many miners, even, are prone to think that such a lamp is safe under all conditions. But, in truth, the so-called "safety lamp" is only safe when in the hands of a competent man.

The construction of the lamp is such that its flame is isolated from the atmosphere surrounding the lamp chimney. The gas-charged air enters the combustion chamber and burns within the lamp, but the flame of the burning gas is prevented from passing out by the cool wire gauze forming the chimney.

The principle of the cooling effect of wire gauze on flame was discovered by Sir Humphry Davy. He found that as long as the wire gauze is kept clean and cool, flame will not pass through the mesh of the gauze, unless propelled by a strong current of air. It is important that anyone handling a safety lamp should be acquainted with these facts.

As shown in Fig. 1, an ordinary lamp flame has three zones. The inner zone *A* is dark, being filled with the vaporous and solid combustible matter distilled from the oil drawn up in the wick. No air has reached this zone and no combustion is taking place in it. The next outer zone, marked *B* in the figure, is the zone of

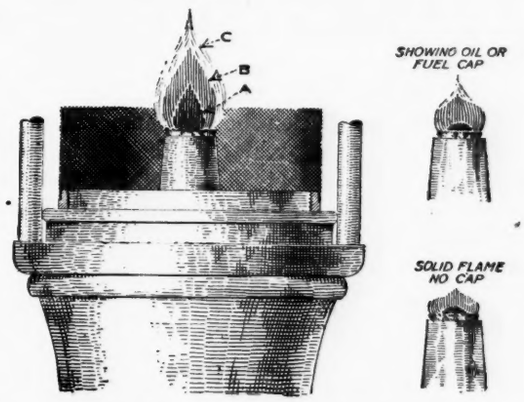


FIG. 1. SECTIONAL VIEW OF PART OF TESTING LAMP

incandescence, where the combustible solids, vapor and gases mixed with air are being consumed. The supply of air to this zone, however, is not sufficient for complete combustion and the combustible matter is rendered incandescent. The outer zone, marked *C*, is nonluminous, the combustion here being complete owing to an excess of air.

In testing for gas, the lamp flame should have the appearance of being glued to the wick, so to speak. It should be a steady, tenacious flame, with a clearly defined outline. Three features must be considered; namely, the size, brilliancy and quality of the flame used for testing.

The *size* of the flame will depend largely on the height of the wick, the kind of oil burned, and the supply of fresh air. The *brilliancy* of a flame interferes with the delicacy of the test and, for this reason, when desiring to make a test, the wick should be drawn down until the flame is only about ¼ in. in height and is nearly nonluminous, as illustrated in the lower right-hand corner of Fig. 1.

The *quality* of the flame is an important factor in making a test and depends chiefly on the fluid burned in the lamp. A light, volatile oil, such as naphtha, benzine or gasoline, gives a more brilliant and less tenacious flame than sperm or cottonseed oil. For this reason, the last

mentioned oils are much to be preferred for the purpose of testing for gas.

Either sperm or cottonseed oil gives a solid flame that is not readily extinguished when proper care is taken. The products of combustion when these oils are burned form a more extinctive atmosphere in the top of the lamp chimney than when a volatile oil is burned. This tends to reduce the force of an explosion should one occur within the lamp, which is thus rendered less liable to fail in gas.

On the other hand, if a light volatile oil is burned the tendency of such oil to vaporize under the heat of the lamp generates an inflammable vapor more rapidly than it is consumed, and materially increases both the force of a possible explosion within the lamp and the chance of failure of the lamp in gas.

The flame of a lamp burning a volatile oil is surmounted at all times by a faint halo. This, as shown in the upper right-hand corner of Fig. 1, has been termed an "oil or fuel cap." In a few instances, I have known gas to be reported by the mine examiner when there was no gas present, the examiner being deceived by the oil cap on his flame. In the use of a heavier oil, as sperm or cottonseed oil, no oil cap is formed and there is no opportunity for the fireboss to be deceived.

I have mentioned the fact that there should be no interior offset or projection in the lamp chimney. A smooth surface gives a greater rigidity or fixedness to the lamp flame. A surface that is not uniform may cause a slight sidewise motion of the flame, which might be taken as an indication of the presence of firedamp. The same effect may be caused by the conflict of ascending and descending currents, in the combustion chamber, when air is permitted to enter the lamp at a point above the flame.

In regard to the wick I much prefer a flat to a round wick. It should be a little wider than the wick tube, so that when completely saturated with oil it will be self-sustaining. When inserted in the lamp, the wick should be perfectly dry and just long enough to reach the bottom of the oil vessel. A short wick, frequently renewed, will give much better results than a longer wick used for some time. The latter is apt to become gummed and clogged so as to prevent the flow of oil to the flame.

To insure a more uniform flame and better illumination, a flat wick tube should be corrugated. The pricker should be so arranged as to sweep over the full width of the wick tube. It should operate at a slight angle with the top of the tube. To prevent extinguishing the flame, the crust should be sheared from the top of the wick, at one end first. The flame should then be allowed to ignite that end before shearing the crust from the other end of the tube. The pricker should work easily and yet not be so loose that it will fail to maintain its position when raised and turned.

The bonnet is one of the chief features in the construction of a good testing lamp. It serves as a chimney, affording a fixed inlet and outlet of the air and gases circulating through the lamp, whereby a good motive column is maintained within the chimney.

I have now described what have seemed to me to be the more important features of a good testing lamp. There only remains to consider some means that will enable a fireboss to measure correctly the height of the flame cap he observes when the lamp is raised into a body of gas. The simplest and most certain means of determining the percentage of gas indicated by a given height of flame cap is that designed some years ago by Messrs. Beard and Mackie, and known as the sight indicator. This device, shown on the right of Fig. 2, consists of an upright standard secured firmly to a circular disk that fits over the wick-tube in a safety lamp. As shown in the figure, seven platinum wires are mounted on this upright. The lower or standard wire is straight, while the upper percentage wires are looped at the center, which enables them to be more clearly seen and not confused with the wires of the gauze chimney of the lamp. On the left of the figure, the device is shown inserted in a common Davy lamp, which is the favorite lamp with firebosses, in testing for gas.

In the use of the sight indicator, the height of the flame is so arranged that the lower standard wire shows a slight incandescence in fresh air. When the lamp is then exposed to air containing gas, the percentage of

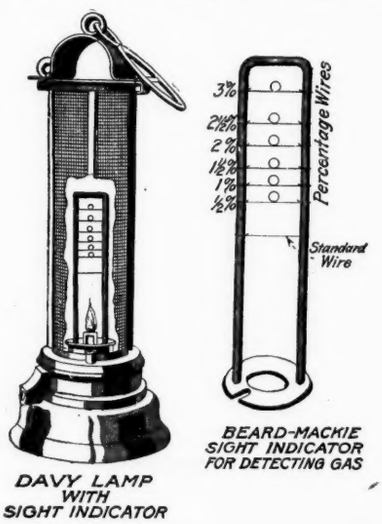


FIG. 2. TO MEASURE PERCENTAGE OF GAS IN AIR

gas present is indicated by the incandescence of one or more of the percentage wires. The uppermost one of the wires thus incandesced marks the percentage of gas present.

For example, if two of the loop wires are incandesced there is 1 per cent. of gas present; but if the third wire also shows an incandescence there is 1.5 per cent. of gas, etc. Should all the wires show incandescence, there is at least 3 per cent. of gas present in the air, and steps should at once be taken to avoid disaster, owing to its possible ignition. When between 4 and 5 per cent. of gas is present the lamp will generally fill with flame and must be promptly though cautiously removed from the body of the gas.

The sight indicator is the most accurate and speedy means of detecting the percentage of gas present in mine air that has been devised and should be used by all firebosses, in order to standardize their reports and bring these to the same basis of measurement. This is very important in reporting gas found in the air splits circulating in the different sections of a large mine. In testing for gas with this indicator, the incandescence of the wires reduces the danger of an explosion occurring within the lamp's chimney, and renders the lamp flame less liable to extinction.

Mine-Car Axles

By B. P. LIEBERMAN
New York City

SYNOPSIS—*The suitability of iron or steel for use as mine-car axles depends upon both its chemical analysis and physical structure. A steel of proper analysis may be improved for use as an axle by mechanical working or by proper heat treatment. This latter method is rapid, positive and under easy control.*

A FAMILIAR sight around some coal-mine repair shops is the large number of discarded mine-car axles. Some of them are bent or broken, while others are excessively worn at the journals. Some of these axles doubtless failed in service, causing a wreck somewhere along the haulageway. The discarding of these axles is in itself an item of expense, but far more serious is the delay in production caused by wrecks and the necessary repairs, not to mention the element of danger to the miners.

Why do axles fail, and why is not something done to eliminate failures of this kind? Axles fail on account of overload or abuse, or they may be made of material unsuitable for the purpose. Their failure is often considered a necessary evil and something that cannot be avoided. Some mine operators try to remedy the difficulty by replacing such axles with ones of larger diameter. Such a procedure is quite expensive, as it affects also the wheels and axle boxes and in addition materially increases the dead weight of a mine car.

Coal-mine operators are bound to have trouble with their mine-car axles as long as they continue to specify in their purchase orders just "axles." If they follow this practice, they do not know whether they get an axle made of wrought iron, a poor grade of steel or a steel too low in carbon. It is evident that one kind of steel must be most suitable for the purpose. This kind does not necessarily have to be the most expensive material.

The Proper Size of Axle

An axle is properly proportioned when it is capable of standing the load to which it is subjected without being permanently deformed and with a reasonable margin of safety to take care of extraordinary conditions. In addition, the material must be such that the axle performs under these conditions without showing undue wear at the journals and without being affected by fatigue or crystallization, which would cause it to break unexpectedly and before it has given full service.

The ability of an axle to withstand bending action is proportional to its cross-section and to the allowable working stress of the material from which the axle is made. The working stress is the ultimate tensile strength divided by the factor of safety.

The figures in Table I illustrate plainly the difference which exists between the different materials from which mine-car axles may be made.

Table I shows that the strength of different grades of steel varies between wide limits. In other words, of two mine-car axles of the same diameter, and alike in all respects except material, one axle may stand four or five times the load which the other one will endure, and this in spite of the fact that the axles look exactly alike from the outside.

In the table, as will be noticed, the different kinds of steel are listed simply according to the amount

TABLE I. DIFFERENCE IN MATERIALS ENTERING INTO THE CONSTRUCTION OF MINE-CAR AXLES

Material	Ultimate Tensile Strength, Lb. per Sq.In.
Wrought iron	45,000
Low carbon steel, about 0.08 per cent. C	55,000
Low carbon steel, about 0.20 per cent. C	65,000
Medium carbon steel, about 0.30 per cent. C	75,000
Medium carbon steel, about 0.50 per cent. C	90,000
Nickel steel, 3½ per cent. nickel	100,000
Heat-treated steel	110,000 to 230,000

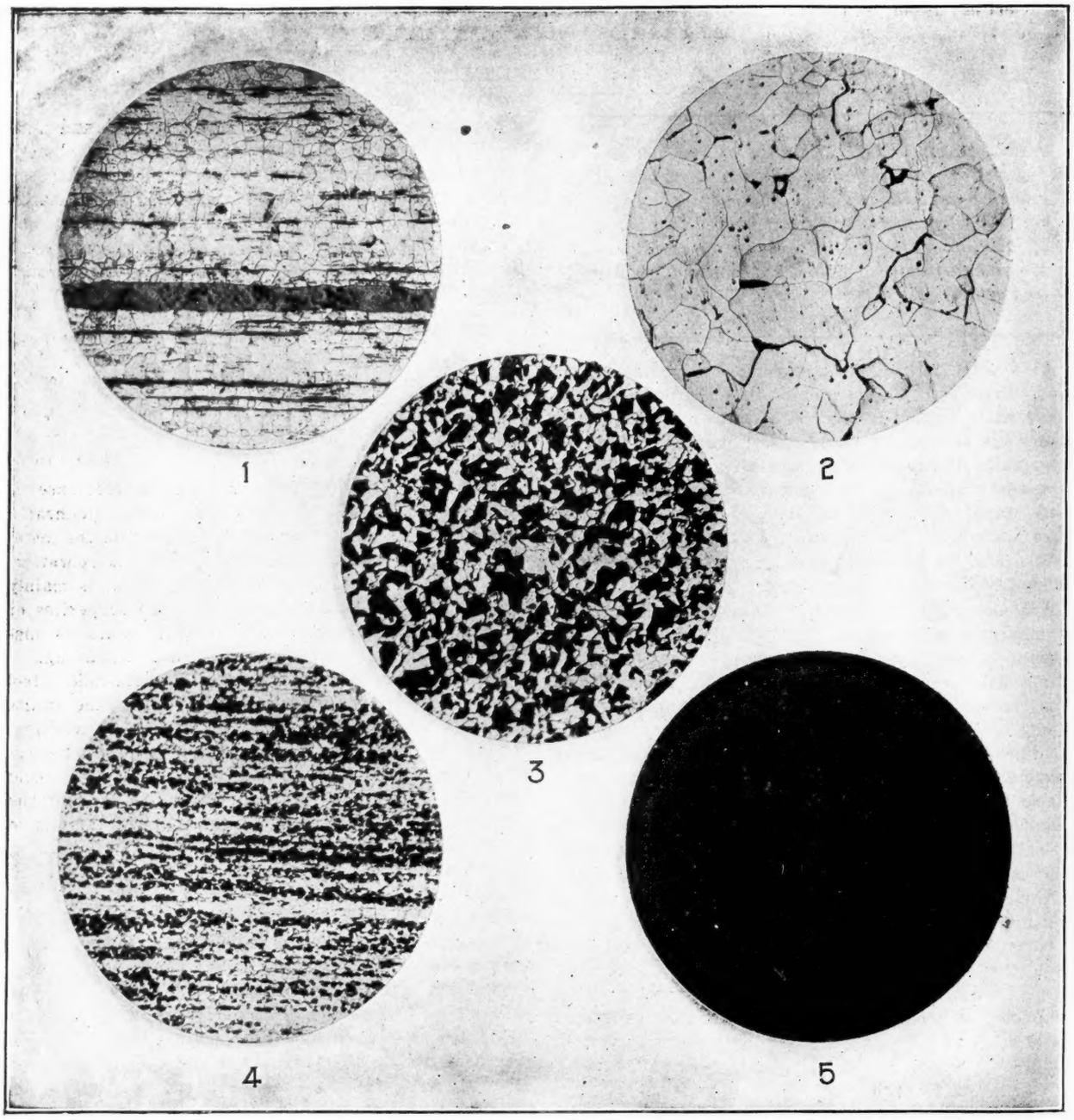
of carbon which they contain, and no reference is made to such names as machinery steel, openhearth steel, axle steel, etc., under which designation the material of axles is sometimes familiar to mine operators. The figures in the table show plainly that it is mainly the amount of carbon which controls the properties of the steel, and therefore such general names as machinery steel, etc., are meaningless and misleading.

Even such material as cold-drawn or cold-rolled steel may possess properties varying between wide limits unless the amount of carbon is specified. Cold working, as will be shown further on, improves the physical properties of steel to a certain extent. As far as cold rolling is concerned, this process is little used at the present time, and steel which goes under this name is cold finished either by cold drawing or cold turning and polishing. The cold-drawn grade is used in the smaller diameters of axles or those up to 2 in., as well as the lower carbon steels, while the cold turned has been supplied for larger diameters and higher carbon steels above 0.25 per cent. C.

The fact that the hardness of steel increases in the same proportion as the ultimate strength, as given in Table I, has been utilized for testing purposes. By means of a simple testing device the surface hardness is measured, and this bears a direct relation to the physical qualities of the material.

It is customary to designate hardness either by Brinell number or by scleroscope number. The Brinell instrument forces a steel ball of standard size under a standard load into the metal under test. The Brinell number then equals the pressure on the ball in kilograms divided by the area of indentation surface in square millimeters. In this test the diameter of the steel ball is 1 cm., the pressure on the ball is 3000 kg., the area is determined by measuring the diameter of the indentation with a microscope and by reading from a table the corresponding hardness number.

With the scleroscope instrument, hardness is indicated by the rebound of a small steel weight with a diamond tip from the surface of the test piece. The weight is allowed to fall about 10 in. and the distance it rebounds is taken as a measure of the hardness of the sample. A scale is provided which is divided into 140 equal parts, and the hardness is expressed



FIGS. 1 TO 5. MICROPHOTOGRAPHS OF THE CROSS- SECTION OF IRON AND VARIOUS STEELS

as the number on the scale to which the weight rebounds.

It should be remembered that the scleroscope number in itself does not mean anything at all. It is simply a means for comparing the hardness of different grades of steel and for specifying the hardness desired for a certain axle or other part. With the Brinell instrument the hardness number is an absolute value, expressing kilograms per square millimeter which the metal withstood. Table II gives the average hardness number of a few grades of material used for axles.

One property of steel which must be considered is its ductility. Ductility is measured by the amount a steel elongates or stretches before breaking. The more brittle a steel, the less ductility it possesses. A certain amount of ductility is required to make an axle stand up under shocks, and with an increase in hardness the ductility rapidly decreases. This is the reason why, for instance, an axle after heat treatment has to be drawn or tempered. This naturally decreases its hardness; but it has to be done as otherwise the axle would be hard, like glass, and would snap off when running over rail joints or switches.

TABLE II. AVERAGE HARDNESS NUMBER OF DIFFERENT MATERIALS

Material	Hardness Number—Brinell	Hardness Number—Scleroscope
Wrought iron	85	13
Low carbon steel, about 0.08 per cent. C	110	16
Low carbon steel, about 0.20 per cent. C	125	19
Medium carbon steel, about 0.30 per cent. C	150	23
Medium carbon steel, about 0.50 per cent. C	175	27
Nickel steel, 3½ per cent. nickel	200	30
Heat-treated steel	220 to 460	33 to 69

Steel may be considered primarily as an alloy of iron and carbon, and while it always contains impurities which have some influence on its physical

properties, carbon is its most important ingredient and regulates and controls its chief qualities. Pure iron is extremely soft, very ductile and of low tensile strength.

Besides carbon, other elements are sometimes introduced into steel, such as nickel, chromium, vanadium, etc. Such additions are desirable either on account of their deoxidizing power or because they improve the physical properties of the steel. For mine-car use nickel steel is perhaps the best known of these alloys. Nickel imparts to steel a high elastic limit and great toughness under shock.

Structure Is As Important As Analysis

The composition of steel can be determined by chemical analysis, but its structure or anatomy can be ascertained by the use of the microscope. Chemical analysis calls for the complete destruction of the anatomy of the steel; micrographic analysis is based on the anatomy itself. In the microscope a highly effective tool is placed in our hands for observing with our own eyes the structure of the different kinds of steel in their normal condition, as well as to observe the effect of heat treatment and mechanical working, such as cold rolling. Looked at under the microscope, light and dark particles can be distinguished. The light spaces show the crystalline grains of carbonless iron or free ferrite, while the small dark masses contain the carbon in the form of carbide of iron, together with some iron. No pure carbon ordinarily exists in steel in the free state. The dark masses are called perlite. The perlite possesses considerable hardness and is therefore more desirable than the ferrite. On account of its softness the ferrite wears off quite rapidly.

Fig. 1 shows a sample of wrought iron which is representative of the material put into wrought-iron axles. The absence of dark spots proves that there are no more than traces of carbon contained in wrought iron. The dark bands are slag, which gets into the wrought iron during the process of manufacture. The absence of carbon makes wrought iron extremely soft, while the layers of slag cause it to flake off at the journals.

Fig. 2 shows a sample of low-carbon steel which was taken from an axle that failed. This piece of steel contains about 0.10 per cent. carbon. Such an axle will soon become rough at the journals and will rapidly deteriorate. This is exactly what happened in this case.

Fig. 3 shows a sample of steel containing 0.40 per cent. of carbon which was taken from the surface of a hot-rolled steel axle that stood up without excessive wear. The larger percentage of carbon is clearly illustrated by the increased number of dark masses.

Fig. 4 shows how an axle looks which contains the same amount of carbon as that shown in Fig. 3, but which has been subjected to a process of mechanical working, such as cold drawing or cold rolling. This process has broken up the particles and has caused a finer structure, particularly on and near the surface, where the effect of rolling is most pronounced.

A much finer structure than it is possible to secure by mechanical working can be obtained by heat treating. It is a peculiarity of steel that it changes its structure when heated to a certain temperature. When this change is arrested by quick cooling, such as quenching, the fine structure is retained.

Fig. 5 shows a sample of the same axle as shown in Fig. 3, but after heat treatment. The constituents are now so thoroughly intermixed that it is hard to distinguish the individual particles any longer. Such an axle necessarily possesses a considerable degree of hardness, depending chiefly on the amount of carbon.

Inasmuch as the amount of carbon contained in wrought iron and low-carbon steel is negligible, it is obvious that neither wrought iron nor low-carbon steel can be hardened appreciably.

No picture of nickel steel is shown; it would look somewhat similar to Fig. 5. Such steel, with proper heat treatment, is practically a homogeneous mass showing no grain or fiber. It has a somewhat better wearing quality than carbon steel and possesses extraordinary power to resist shocks.

The process of heat treating is quite simple, and comparatively little equipment is needed for the various operations: a furnace, whose temperature can be regulated, a pyrometer for measuring temperatures and a tank with oil for quenching.

An axle with a carbon content of about 0.45 per cent. would, for instance, have to be treated as follows: Heat from 15 to 30 minutes at 1490 to 1510 deg. F., quench in oil, reheat for 30 minutes at 400 deg. F. and cool in air.

Ductility Is Secured By Tempering

The first treatment produces a hardness that would be far too great for mine-car service. The axle is therefore tempered somewhat to obtain sufficient ductility. This is accomplished by the second treatment. The higher the reheating temperature is made the softer the steel will be. A reheating temperature of 400 deg. F. produces a hardness of about 300 Brinell (42.5 scleroscope), while a reheating temperature of 800 deg. F. would produce a hardness of about 250 Brinell (37.5 scleroscope). Compare this with the hardness of the axle in its original condition, which was about 170 Brinell (26 scleroscope). In other words, the heat treatment has raised the tensile strength of the steel from about 85,000 to about 150,000 lb. per square inch in the first case, and to about 125,000 lb. in the second case. In addition, the particles in the steel have been so thoroughly intermixed as to offer the greatest possible resistance to wear on the journals. A hardness of approximately 250 Brinell has been found ample for the severest requirements of mine-car service.

An axle does not necessarily have to be heat treated throughout its entire length, but only on the points where breakage or wear are most liable to take place, which is on the ends. This method can be successfully carried out with a much smaller heat-treating equipment.

A heat-treated axle, therefore, has quite an advantage over ordinary axles and is desirable for the following reasons:

1. It has many times the strength of an ordinary axle. The chance of bending or breaking in service is comparatively remote.

2. Its ductility, if properly tempered, is sufficiently great to make it withstand the shocks and abuse of ordinary mine service.

3. On account of the thorough intermixing of the carbon with the iron, the wear at the journals is negligible without necessarily causing additional wear in the wheel hubs or bearing boxes.

The advantages to be derived from heat-treated axles for mine cars were not appreciated until a few years ago, when the ever-increasing demand for greater load capacity, for greater speed and quite often for longer trips, set up a demand for better axle material. The advantages arising from their use is well illustrated by the experience of a prominent producing company which stated that "before using heat-treated axles, we sold about a car and a half of scrap axles every year; but since using heat-treated axles we have not sold one in seven years."

Generally speaking, it is preferable to utilize heat-treated axles from the standpoint of ultimate life and freedom from possible failures. But under net loads of from 1 ton to 3½ tons of coal, cold-turned and polished axles of 0.40 to 0.50 per cent. carbon content have been used successfully. The use of the untreated axles must, however, be fully reconciled with the load on the bearing surfaces, as the lack of a suitably hard wearing surface superinduces disastrous wear.

The use of any kind of an axle is an engineering problem that should be submitted to the mine-car manufacturers or other specialists for their approval. Such a course will tend to bring about greater economies in many directions.

Axles Should Be Made of Proper Material

All these qualifications which a successful axle should have apply equally well to mine cars equipped with ordinary plain-bore wheels or boxes, as well as to cars equipped with flexible roller bearings. While the life of axles in connection with plain bearings would be considerably increased if they were made of proper material, a combination of the same axles with flexible roller bearings would last practically forever if reasonably well housed and taken care of. The rollers of these bearings operate directly on the surface of the journals without an extra sleeve, and the axles in such cases have been found neither to bend, break, nor wear down at the journals.

As the advantages of heat-treated, alloy and higher carbon axles are becoming better understood and appreciated, the demand for such axles is rapidly increasing; and several axle manufacturers have installed the equipment necessary to furnish such axles of first-class quality at short notice. As far as the size of the axles—that is, their diameter—is concerned, the following dimensions are generally preferred:

	Capacity of Mine Car Tons	Size of Axles at Bearing Seat in Inches Bituminous	Anthracite
1		2	
2		2¼@2½	2½
3		2½@2¾	2¾
4		3	3
5		3	3

In the majority of bituminous mines the bearings are located in the wheel hubs, while in the anthracite region and portions of the bituminous fields it is standard practice to use inside or outside self-aligning journal boxes. In the latter case the axles are usually ¼ in. in diameter, larger in the middle than at the wheel and bearing seats, thereby giving additional strength through increased cross-sectional area.

Central Pennsylvania Miners Go "Over the Top"

The production of coal in central Pennsylvania for the week ended July 13 has exceeded the production for any single week in the history of central Pennsylvania. The officers of the United States Fuel Administration and the Central Pennsylvania Coal Producers' Association are jubilant at the showing made for this period. They state that the figures are beginning to show the results of the campaign to increase the production of coal launched by the Central Pennsylvania Coal Producers' Association several weeks ago.

During the week ended July 13 central Pennsylvania produced 1,327,500 tons of coal. During the week ended July 6, 854,613 tons of coal were produced. This was the week of the Fourth of July. The week ended June 29 was a full week. The production was 1,142,420 tons, or an increase over the week ended June 29 of 185,080 tons. In this manner the miners are attesting their loyalty and patriotism to their country.

Central Pennsylvania being one of the most important fields in the United States, this increase in production of coal will be heartily welcomed by the United States Fuel Administration officials at Washington.

Rembrandt Peale, of the United States Fuel Administration, on a recent visit to Altoona, stated that it is the wish of the United States Fuel Administration that the mining towns, if possible, hold all their celebrations of the great victories of the American and French armies over the German armies in the evening, to the end that the production of coal may not be hindered at this most vital moment of the war and that the armies in the field may be kept in the supplies, guns and munitions necessary to continue the offensive to its conclusion —the absolute and complete defeat of the German armies. In other words, celebrate by increasing production rather than by cheers.

The splendid coöperation of the international officials of the United Mine Workers of America, President Frank J. Hayes, Vice President John L. Lewis, together with many district and local officers of that organization, is chiefly responsible for the wonderful showing, and where the miners and operators have not taken up this proposition seriously this showing should be an inspiration to them of what can be accomplished and their duty in the premises.

The Central Pennsylvania Coal Producers' Association states that the goal set for central Pennsylvania, namely 1,300,000 tons production per week, has been exceeded and the figures raised to 1,400,000 tons.

Teamwork Between the Engineer with his theoretical training and the mine foreman with his practical experience would obtain the maximum success. In a great many cases the success or failure of the mine hangs on the teamwork of these two men. Ofttimes the engineer looks down on the suggestions of the mine foreman, thinking his lack of theory does not give him the proper view of the situation, while the mine foreman thinks the engineer too theoretical. The engineer should temper his theory with the mine foreman's practicability, and vice versa, to obtain the best results.

BOOK REVIEWS

A Comprehensive Work on Mining

MINING ENGINEER'S HANDBOOK—Written by a staff of specialists under the editorship of Robert Peele, Professor of Mining Engineering in the School of Mines, Columbia University. Pages X + 2307 + 98 index; 4½ x 7¼ in.; adequately illustrated. John Wiley and Sons, Inc., 432 Fourth Ave., New York City, publishers. Flexible Fabrikoid binding. Price $5 net.

In quality and quantity of material, "Peele's Mining Engineer's Handbook" stands probably first among all the books on mining in general, especially technically and in relation to metal-mining costs. It is a worthy companion of the handbooks of Trautwine, Merriman, Fowle, Kent, Marks and Kidder, in kindred engineering fields. Its aim is, of course, to cover every phase of mining. Coal receives a place somewhat larger than that afforded other minerals, but not the place which would be given to it, of course, in a volume with a less extensive scope.

However, after all, the differentiation between the work in the coal mining and other fields has been largely the cause of the slow advance in both. There are so many likenesses between metal mining and coal mining that we cannot conceive anything which would make more definitely for scientific progress than for engineers in the two branches to replace one another for a few years.

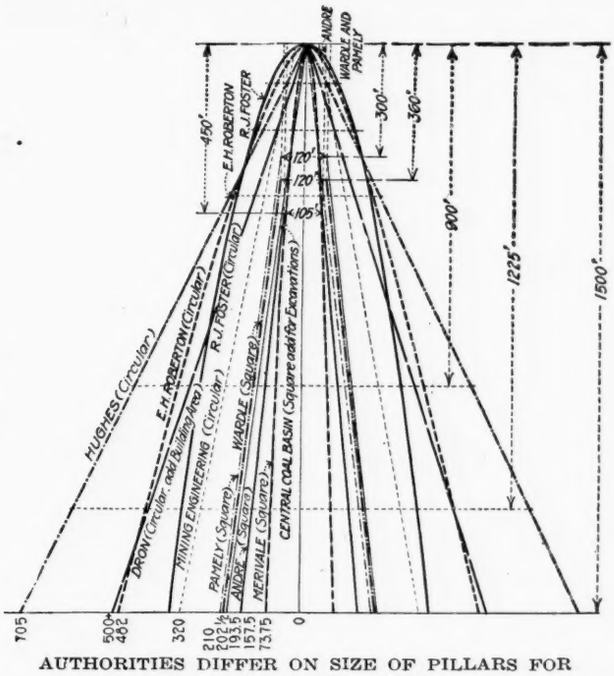
The engineers of each form of mineral are separated locally and industrially. They solve their problems separately. They resolutely contend that the solution of a problem in one line of work would be impossible in another line. They rarely study one another's methods and problems. A book like the one under consideration brings the two realms of mining together. Wider apart than two separate nations in their methods of work, here is a chance for one to learn from the other.

When one looks at the 2307 pages of fine typed material —for there is that number without the index—when one notes how important are all the subjects treated and how condensed is their treatment, one feels little disposed to regret that something is omitted. No one will contend that "Geological and Mineral Deposits," so ably reviewed by J. F. Kemp, professor of geology at Columbia University, did not deserve many more pages than forty, of which coal itself has but two or three. There is room, however, for little more than general principles, and the reader may be assured that what is spared in this department gives space to strengthen all the rest. After all, geology is so varied as to be local, and to study it rightly one must have a local interpreter.

The principles of earth excavation, explosives, rock excavation, tunneling, shaft-sinking, boring and even prospecting, development and exploitation of mineral deposits are more general. They have an appeal as universal as mining. If any systems are peculiar to any one industry—and they are good systems—there is some reason to believe that it is a reflection on the progress of coal mining or some other form of mining that they have not been introduced there under the special conditions likely to be favorable to their use.

The traditions of mining are hard to break. They are the outcome of special environments, conditions and sociological necessities, and being long established they rule us and not we them. We put new men into the field, but we first train them into the ways of the region and into the system of the special branch of the industry to be entered. Eventually, these would-be innovators become obsessed with the fear of the past. They hesitate to break the tradition by following the lead of men in another branch of the industry or in another field, even when they recognize that the men in these other fields are facing similar problems. Other matters treated in Peele's handbook and having a somewhat common application to all forms of mining are underground transport, hoisting plants, shaft pockets and ore bins, mine drainage and ventilation, compressed-air plants and electric power for mine service.

Much has coal mining done to improve transport in metal mining, and in return shaft pockets that originated in the metal mines are now almost the latest thing in coal mining. Many coal operators are already wondering if the mine car has to be hoisted on a moving scaffold to the dump when a skip will do the work as well and a pocket will aid to make the work continuous, and some are not only wondering, but are preparing to hoist in skips. In recalling the indebtedness of the two branches of the service to one another, it may be noted that ventilation has almost been invented and patented by the coal mine. The metal mines hung far behind, as if they did not want to infringe. Even the flexible conduit as a mine device came to light in the coal mines, but it appears to have had its most wonderful development in the metal-mining industry, due largely to



AUTHORITIES DIFFER ON SIZE OF PILLARS FOR VARYING SHAFT DEPTHS

the lack of due appreciation in the industry which first welcomed it and for which it has an almost unlimitable field of usefulness.

Other sections of the handbook being reviewed cover surface and underground surveying, mine geological maps and models, mine organization and accounts, mining costs, wages and welfare, mine air, hygiene, explosives and accidents, mining law, mine examinations, valuations and reports, aërial tramways and cableways, mechanical conveyors, ore dressing and sampling, assaying, ore testing, purchasing and treatment, gold amalgamation and cyanidation, mathematics and mechanics, chemical notes and tables, hydraulics, engineering thermodynamics, steam engines, boilers, pumps, turbines, gas engines and accessories, electric engineering, structural design, mineralogy and tables.

Purposely we have omitted the preparation and storing of anthracite "coal" by Paul Sterling and the preparation and the storing of bituminous coal by H. McKean Conner, both interesting presentations of the problems presented.

Protest may be made against the persistence with which A. M. Bateman in this volume, and other writers in other places, have clung to the questionable theories of subsidence promulgated by earlier writers. A little concession is found in the illustration 548, on page 738, but how futile it is to put the tensile stresses at the edge of the pillar. If the pillar gives at its edge (and what pillars will not do so?), pillar and roof will remain in contact, the pillars rounding to conform with the undulations in the roof. The main bend, and therefore the tension, will be back over the pillar and not at its edge. True we have to the contrary the illustrations of "main break" and "after break" perpetrated by the unimaginative Haussè (see Fig. 559), and the illustration of fracture normal to bedding of Callon (see Fig. 560). But sometimes it is impossible to bow to authority however profound.

Nothing is said about real arching and doming in the pages on subsidence. The only reference to be found is to the pseudo-arches of the early textbooks. Mysterious indeed is the disposition to ascribe to the roof of the underworld laws peculiar to itself. As in the days of Kirchner, theorists can imagine anything in a mine. But after all the roof after being separated from the top of the coal seam is an elastic beam, or rather plate, and this when broken forms an arch, or rather a dome. That the marvelous sketches on pages 732 and 743 can still find their way into scientific treatises shows how a subject not yet looked upon as economic and therefore vital to business success can continue to be misunderstood.

It may be added that Fig. 562, on shaft pillars, is full of errors both of scale and fact. Moreover, part of it is based on an assumption of coal thickness which assumption is not stated. The subsidence pages are merely digests of the well-known Young and Stoek bulletin on that subject. Our illustration on the preceding page shows a diagram of the shaft pillars proposed by the various authorities for different shaft depths. It is based, where the coal thickness is regarded as a factor, on a seam 9 ft. thick.

Key to Recent Engineering Literature

ENGINEERING INDEX FOR 1917—Compiled from the Engineering Index, published monthly in "Industrial Management" during 1917. Pp. 360. 6½ x 9½ in.; no illustrations. The Engineering Magazine Co., 6 East 39th St., New York City, publishers. Cloth boards. Price, $3.

Engineers rarely see more than just a few journals and technical publications, and so a great deal of engineering development passes them unnoticed. Moreover, the articles that they glance over and regard as unimportant today may seem tomorrow indispensable to fill needs that have changed. In consequence, all engineers must depend on the work of the patient cataloguer, who keeps them in touch with the advances of the times and tells them just where they can read about the progress of any special line of engineering endeavor.

To those who live where libraries are not (and most mining engineers are thus circumstanced) there is always the opportunity of getting articles photostated and translated at a reasonable figure by the library in the Engineering Societies' Building, 29 West 39th Street, New York City. Service such as this makes a book like the "Engineering Index" extremely valuable. Just at present left-over copies are not numerous, and the collector of such copies for resale is perhaps not over-stocked; but still there are a few such men and their services can be drawn upon at a figure that discounts even the photostat. For this reason, it is interesting to note that, as far as is possible, the Engineering Magazine Co. is prepared to perform this service to the great advantage of industry.

The Index classifies the articles on current technical literature appearing in some 25 publications published by 17 nations and colonies and in six languages. About three-fourths of these journals are printed in English, the others being principally French, Spanish, Italian and Dutch. There are no German references, except as found in a Zurich paper, the *Schweizerische Bauzeitung*.

Many of us seeking enlightenment are asking our neighbors where we can get information. This volume gives, for the year 1917, complete and ready answers to our questions.

Developments of the Granby Consolidated Mining and Smelting Co. on Vancouver Island

By R. Dunn
Victoria, B. C.

In view of the position in which the Granby Consolidated Mining and Smelting Co., Nanaimo, B. C., finds itself through the Dominion government's attitude on the settlers' rights issue, it is interesting to show what it has done on the coal lands the title to which now seems doubtful.

A standard-gage railway has been built to the mine site, a distance of a mile. Part of this has been laid through sandstone rock, necessitating heavy cuts at places. At the end of the spur the necessary grading for the different tracks at the mine yard is completed and some of the tracks have been laid. A temporary tipple has been constructed at the mine yard, a little to one side of where the main tipple will be erected, and all preparations are complete for the shipment of coal at any moment. Some 700 tons is lying at the mine mouth for shipment.

Fifty acres of land have been cleared and graded for mine buildings and dwellings to accommodate employees. Nineteen substantial dwelling houses are under construction and almost completed, and foundations are in for a large number of permanent mine buildings including office, messhouse, store, lamphouse, etc.

A good substantial saw-mill has been erected capable of turning out 12,000 ft. per day. A large brick smokestack and foundations for two 250-hp. boilers have been completed and two Stirling water-tube boilers are on the ground ready for installation. Three slopes are in course of being driven. The slope for the manway is now down a distance of 196 ft., and at the face the coal is 11 ft. in thickness and of good quality.

At a point 175 ft. down a level has been driven to the right at right angles to the line of the slope, and places are being driven back from the level to connect with the other two slopes which are being driven from the surface. This level has been driven in a seam which averages 11 ft. in thickness, so that it may be said that all three slopes have 11 ft. of coal at the faces.

Three hundred thousand dollars have been spent to date on this development, and the mine will be ready to ship 300 tons a day within two months and by the end of the year should be producing 700 to 800 tons daily. When the investment at the mines is added to that at Anyox, the company's smelter center, where by-product coke ovens are being installed, it will total in the neighborhood of $1,000,000.

In most of the common types of mechanical stokers the distillation of volatile matter occurs in the presence of oxygen, whereas in hand-fired furnaces the distillation takes place in almost entire absence of oxygen, all of the latter being consumed as it passes through the fuel bed. Even if there should be some tendency to decomposition with the mechanical stokers, the presence of large percentages of oxygen at the point of distillation makes it possible for the hydrocarbons to react with oxygen before the deposition of carbon can really take place.—*Bureau of Mines Bulletin No. 135.*

Weekly Production Statistics

Production figures for the week ended July 20 are as follows: Bituminous, 12,956,000 tons; anthracite shipments, 40,664 cars; beehive coke, 668,000 tons; byproduct coke, 567,500 tons.

While bituminous coal production fell 2.4 per cent. below that of the record accomplishment of the week ended July 13, it came as no surprise. It was known in advance that it would be improbable that so heavy a production could be duplicated during the succeeding week. The production, however, looks especially good when compared with the 11,230,000 tons for the corresponding week of last year.

Anthracite forwardings slumped 4.3 per cent. and with the exception of the week which included July 4 went lower than at any time for many weeks.

While beehive coke production decreased slightly during the week ended July 20 the rate of production in the Pennsylvania districts remained practically the same with labor shortage forming the only retarding factor of importance. The car situation has a negligible bearing on production at this time.

Byproduct coke production continues to climb slowly into new high records. The byproduct ovens of the country were operated at 91.2 per cent. of full time capacity during the week ended July 20. If plant repair could be obviated, this industry could be operated at the present time at 95 or 96 per cent. of full time capacity.

Bunker Coal

Further steps were taken last week by the Fuel Administration to improve the quality of coal for the use of ships in the Atlantic and the Gulf trades. The Tug River field of West Virginia has been designated as a field separate from the Pocahontas field. All coal originating in the Pocahontas, New River and Tug River fields, which may be classified by the Tidewater Coal Exchange for consignment to pool No. 1 or pool No. 2 at Hampton Roads, will be admitted as permissible bunker fuel. Coal in pool No. 44 at Hampton Roads also has been specified as permissible for bunker use. At New York, Philadelphia and Baltimore, coal from mines on the Navy's list, which classifies for pool No. 1, when not mixed with coal from any other pool, is to be used for overseas trade. Coal for that purpose also will be drawn from mines on the Pennsylvania, the Baltimore and Ohio, the Western Maryland and their connecting lines which take pool No. 9, when not mixed with coal from any other pool. Coal from the New York Central and connecting lines classified for pool No. 4 or pool No. 10, as well as coal from the Pennsylvania, the Baltimore and Ohio, for consignment to pool No. 10 as well as pool No. 1 and pool No. 9, is admitted for coastwise trade.

No slack or sizes smaller than mine run may be accepted for bunkering purposes except by special permission by the Fuel Administration.

Bituminous Supplants Anthracite

More than 200,000 tons of anthracite have been stricken from Army requirements for posts, camps and cantonments, as a result of the activities of the fuel and forage division of the Quartermaster Corps. The anthracite has been substituted by bituminous coal and coke, which is available much nearer by. As a result, a saving of 33,000,000 ton-miles has been effected. The Army appropriation has been saved $300,000 in the cost of the coal and $200,000 in the cost of its transportation, to say nothing of the advantages which have come by releasing so large a tonnage for domestic consumption and by saving railroad transportation for other purposes.

Pushing Production

James B. Neale, director of production for the United States Fuel Administration, is encouraged greatly by the success which is attending his campaign for greater production. The work is rapidly being reduced to a systematic endeavor.

At each mine a production committee of six is to be appointed. Three representatives of the mine workers and three of the management will comprise this committee. The committee will do all in its power to spur production to its maximum. These production committees act under the immediate direction of a production chief who will be appointed in each fuel administration district.

Mr. Neale is preparing a letter setting forth some of the more important features of the campaign. He will make it clear that there are plenty of workers to send the coal production to unprecedented amounts, despite the draft, if each miner will work eight hours a day and six days a week. He will also point out that there are many ways in which the operators must do their part.

Mr. Neale points to the achievement of southwestern Virginia as an indication as to what can be done. That district during the week ended July 13 operated at 94 per cent. of its full time capacity. During that week it produced 193,626 tons, which was the greatest weekly

production in the history of the field. Increased labor efficiency was largely responsible for the showing which was made.

Another example of a practical outgrowth of the campaign is the return at the mines of the Mercer Iron and Coal Co. at Stoneboro, Penn., of 150 miners, who had retired from active work as a result of having passed the age limit. These men again are actively mining coal and are enthusiastic over the fact that they are having an opportunity to contribute directly to the winning of the war.

Ralph D. Paine, a writer of national reputation, has been drafted by Mr. Neale to assist in the production campaign.

Smokeless Price Adjustments

Brokers' commissions continue to be one of the most active matters under study at the Fuel Administration. This was the subject of conference last week between Fuel Administration officials and smokeless operators from West Virginia. Price adjustments in the Pocahontas, New River and Tug River fields also were discussed. At present there are nine prices applying on the coals originating in the smokeless area. When the different grades and different allowances and the commissions are considered, there are 48 different prices on the existing schedule. A means of simplifying this schedule is under consideration, but it is probable that no new plan will be announced until the smokeless operators have been given an opportunity to complete new cost sheets which are being compiled.

Brief Washington Notes

Prices covering anthracite mined in Virginia have been announced as follows: Egg, $5.40; stove, $5.75; nut, $5.75; pea, $4.60; buckwheat, $1.55; culm, 90c.; briquettes, $5.30. The prices are subject to a general reduction of 30c. until Sept. 1.

Coke from beehive or byproduct ovens screened and cleaned for domestic purposes, in mixed sizes, is to take a price $1 less than that fixed for selected foundry coke. This schedule was made necessary by the recent rise of the practice of screening and cleaning breeze piles.

While Lake shipments are far from being in as bad shape as they were last year, it has been found necessary to take special steps to expedite the movement of coal for the Northwest. All district representatives interested have been instructed to give preference to Lake shipments. Of course railroad fuel and coal for byproduct and gas uses move ahead of the fuel destined to the Northwest.

In the hope that the delay may be reduced in securing priority orders for coal mine supplies, Roy A. Rainey, of New York, and David D. Bush, of Chicago, have been placed in charge of a bureau which will look after this matter carefully. The work will be done in conjunction with the priorities section of the War Industries Board.

While the section of the Federal Trade Commission charged with determining the cost of coal production has been transferred by executive order to the Fuel Administration, this in no way interferes with the power of the Federal Trade Commission to make investigations and inquiries along the same line. As a result, the Commission now is launching a new inquiry into the cost of coal production to ascertain if profiteering or irregular trade practices exist.

Five cents per ton may be added to the price of run-of-mine, ten cents to prepared sizes and fifty cents to slack if the coal is thoroughly clean. To get the increase, a special permit must be secured from the Fuel Administrator.

Peat Industry Breaks Record

The peat industry in the United States was prosperous in 1917, for the quantity of peat sold exceeded that sold in any preceding year. According to statistics compiled by C. C. Osbon, of the United States Geological Survey, Department of the Interior, the peat sold in 1917 amounted to 97,363 short tons, a quantity greater by 44,857 tons, or about 85 per cent., than that sold in 1916, and by 42,220 tons, or nearly 77 per cent., than the record annual sales, 55,143 tons, established in 1911.

The average price received for peat in 1917 at the point of consumption was a little more than $7.29 a ton, and the gross market value of the output was $709,900, a gain over 1916 of 26c. in average price per ton, and of $340,796, or about 92 per cent., in market value.

The following table shows by years the output and value of peat marketed from bogs in the United States each year since 1908:

PEAT SOLD IN THE UNITED STATES, 1908–1917

Year	Quantity (Short Tons)	Value
1908	*24,800	*$136,610
1909	29,167	127,042
1910	37,024	140,209
1911	55,143	272,114
1912	47,380	228,572
1913	33,260	197,200
1914	47,093	309,692
1915	42,284	288,537
1916	52,506	369,104
1917	97,363	709,900

* Estimated.

The total number of plants producing peat in the United States in 1917 was 18, an increase of five over 1916. All the producers operating in 1916 except two contributed to the output in 1917, and seven companies that were not represented in that year reported commercial production. Many new companies were organized in 1917 that did not complete their plants in time to contribute to the year's output. The plants known to be at work in 1917 were distributed as follows: California, 2; Florida, 2; Illinois, 2; Indiana, 1; Massachusetts, 1; New Jersey, 5; New York, 3; Pennsylvania, 1; and Virginia, 1.

All the producers reported that the demand for peat exceeded the supply, and some stated that, on account of railroad embargoes and the scarcity of labor, they were unable to meet the demands of their regular customers. Improvements designed to increase production in 1918 were made to substantially all the peat plants operated in 1917.

THE LABOR SITUATION

EDITED BY R. DAWSON HALL

General Labor Review

Dr. Garfield was much heartened by the wonderful response of the mine workers to the appeals of the Fuel Administration for steadier work and larger output. He said that the passing of the 13,000,000 ton mark on the week ending July 13 would warrant the giving of a service stripe to everyone of those taking part in the production of that tonnage. The output in the corresponding week of the year before was 1,479,000 lower. Unfortunately the output of the week ending July 20 was 300,000 tons less than in the week before, though car shortage was only 3.9 and labor shortage 4.2 per cent.

The Fuel Administrator has created a Bureau of Labor which will be charged with the settlement of controversies between coal miners and operators for the period of the war. This is not a radical departure, but it marks the final decision to let mine-labor problems be settled by a Fuel Administration board and not by the War Policies Board of the Department of Labor.

LABOR DISPUTES TO BE SETTLED BY COAL MEN

John P. White, the former president of the United Mine Workers of America, and Rembrandt Peale, a coal operator of central Pennsylvania, are named joint heads of the bureau. Probably no duties different from those they have been recently performing on behalf of the Fuel Administration will be given them. The announcement of the decision to establish the bureau is dated July 23.

Michael Washko's death in the Beaver Meadow Colliery made it necessary for the Lehigh Valley Coal Co. to announce its intention to stand by the *extra vires* declaration of the Anthracite Conciliation Board. That company promptly announced its intention to pay the $150 to the family of the deceased and to comply with the other terms of the dictum relative to the funerals of men killed in the mines. The Brookside colliery of the Philadelphia & Reading Coal and Iron Co. also had a death, but for the first time for many years work continued as usual.

It has always been a cardinal feature of the United Mine Workers of America to keep such persons as are engaged in the selling of intoxicating liquors from membership in the union. When the latest button drive was made in district No. 9 a half dozen saloon keepers who work in the mines were, in accordance with Article 14, Section 2, page 3b, refused buttons on making application for them. The Liquor Dealers' Association has made a complaint, but the by-laws are fixed. The saloon keepers will have to leave the union, and without union membership they cannot work in the mines. The companies in District No. 9 are unofficially urging their men to continue "buttoned up."

MEN AT GREENWOOD COLLIERY RETURN TO WORK

On Saturday, July 20, the Greenwood Colliery mine workers returned to work, agreeing to leave their grievances to the action of the officers of District No. 1. If these officials cannot get a settlement, then the matter will be brought before the Conciliation Board. The Greenwood miners are said to be getting $3.83 per day, whereas other company miners are getting $4.25. If this is a fact an evening up is desirable even though it is clear that the contract does not call for it. No concern can get and keep desirable men if it pays less than the current wage. Mines with less than the usual scale gather, as a rule, all the undesirable men in the community and keep them discontented. The best men are none too good for successful operation, and every concern should seek to have men of at least average quality.

Petty strikes recently occurred at the mines of the Lehigh Coal and Navigation Co., which operates in the Panther Creek Valley, but they have been settled. A strike at the No. 4 colliery of the Lehigh and Wilkes-Barre Coal Co. was soon ended, work being resumed on July 22. Apparently it was a button strike. The men who refused to pay their union dues were aliens, and they were accused of pro-Germanism. They have now left the district.

The men of the Carleton Coal Co. near Dunmore, Penn., a suburb of Scranton, went on strike Friday, July 19, to protest against an increase in the price of house coal. On Saturday the men were confronted with a bulletin reading, "This colliery will be idle until further notice." This notice was soon removed and another replaced it naming Monday as the day of resumption. The men returned to work Monday but they purposed to meet again to discuss the matter Thursday. They threatened that if at that time they were not, or had not been informed of a restoration of the former price they would go on strike again. About 90 men were involved.

The employees of the Lehigh Valley Coal Co. have been talking of striking in the event that the company does not speedily supply their bins with coal. The Lehigh company decided July 25 to give the mine workers the preference in deliveries and to stop all local sales of fuel except those to its own men. The company and local haulers are now busy filling the mine workers' orders.

The Hazleton draft board has decided that it would not regard stenographers and clerks in the purchasing departments of coal companies as essential employees or give them deferred classification in the draft. Howard Zullick, who was engaged by Pardee Brothers & Company in this capacity was the man refused such classification. Edward V. Summers was also refused deferred classification by the Ironton (Ohio) board, which so notified the Hazleton authorities. It had been represented that he was an essential employee of the Cranberry Creek Coal Co., Hazleton, Pennsylvania.

NOT ABLE TO FIGHT, VETERANS GO BACK TO MINES

In central Pennsylvania efforts still continue to induce every man to sign a pledge card to do his best during the continuance of the war. A new source of labor has been unearthed near Stoneboro, Mercer County, Pennsylvania. Stoneboro lies on the edge of the coal field. It is one of the time-honored fields of the state like the Huntingdon and Broad Top region and the Tioga County field. It has a lot of hard-headed Scotch and English miners, who made money by patient, steady work and bought homes. When they reached competency and declining years they left the mines, the coal being high grade, but thin, and somewhat hard to mine.

The call "More coal, more coal" has brought these miners back to the mines to the number of about 150. They have mined so far about 4000 tons and expect to mine 500,000 tons a year. So far the coal is being stacked waiting for railroad communications. The mine will be worked by the Mercer Iron and Coal Co. The spirit of these veterans of the pick is admirable and their example should be followed throughout the mining regions.

At the Pipe Creek mine of the A. J. Morgan Coal Co., in the Belmont field of Ohio the mine workers were idle for two days fearing that pro-Germans would blow up or otherwise injure the mine and its occupants. Twice the mine workers saw strangers lurking near the mine before the whistle blew. Vice President Ledvinka of the United Mine Workers of America with a committee of the employees searched the mine thoroughly but found no evidence of an intruder, so the men returned to work.

In Tennessee, W. E. Myer, the state fuel administrator,

has been much troubled by the threat of a strike at the mines of the Battle Creek Coal and Coke Co., Orme, Tenn. The mine lies near the southwestern end of the Tennessee coal field in Marion County not far from Chattanooga, and where the narrow lens of coal is about to enter Alabama. The men claim they are not getting as much as mine workers in other places. Rembrandt Peale is to act as arbitrator. About 150 men are employed at the Orme mines. As soon, however, as the fuel administrator had made his plea and proposition they decided to keep at work.

In Kansas, 50 foreigners are endeavoring to stop operations in the important Cherokee field, according to word received by Governor Capper from Sheriff Bob Frazier.

Hecla Company Gives Service Medal

By W. L. Affelder

General Manager Hecla Coal and Coke Co., Oliver Building, Pittsburgh, Penn.

The man who stayed at home and did not do his utmost toward helping his comrade who had gone to war will have many unpleasant questions to answer when the war is won and the maimed and crippled soldiers return; but the stay-at-home who did his utmost to supply the necessary sinews of war need have no misgivings.

In order to promote a feeling of pride for duty well and faithfully done among the two thousand employees of the Hecla Coal & Coke Co., of Pittsburgh, Penn., I have devised an Honor Medal for Industrial Soldiers, which is illustrated herewith. A notice printed in five languages—English, Italian, Slovak, Hungarian and Italian—was distributed among the men, and it fully explains the way in which the medals and bars are to be used. The alternation in colors of the bars—silver-plated and bronze—is not really essential, but it enables a person to see at a glance whether or not a man's string of bars is uniformly continuous; whereas, if all bars were of the same color, the omission of a month would not be so readily noticeable. The notice and medal are reproduced below:

"Beginning with the month of July, we will give to each outside or inside employee a medal like the one shown in the illustration, with a bar bearing the date of the month in which he first works every day. For each month that he works every day a bar, engraved with the proper date, will be added. When your buddies come back from the war, you will be able to show them by your badge and monthly bars that you have helped to win the war by working every day. The war cannot be won without coal and coke. You can be of just as great service toward winning the war by working every day as an "Industrial Soldier" at our mines and coke plants as by fighting in Europe.

"Remember that the soldiers do not lay off on account of drinking and holidays. Show them by your badge that you were as good a soldier as they were. If you do not win a medal in July, be sure to get one in August. Then be sure to get a new bar each month." The design of the medal has been patented, but both the medals and easily attached bars can be obtained from the Mine Safety Appliances Co., of Pittsburgh, Penn.

We Will Settle Our Own Disputes

At a recent conference held in the city of Washington, D. C., between the United States Fuel Administrator, Harry A. Garfield, and the international officials of the United Mine Workers of America, a complete understanding was reached whereby all questions pertaining to labor in the coal-mining industry will remain under the jurisidiction of the United States Fuel Administrator. This is in accordance with an understanding previously reached between the Secretary of Labor and the Fuel Administrator.

In order that this arrangement may be made effective, the United States Fuel Administrator has created a Bureau of Labor, to which all matters relating to labor controversies will be referred for settlement. He has appointed John P. White, former president of the United Mine Workers of America, and Rembrandt Peale, a coal operator of Central Pennsylvania, joint heads of this bureau, with power as his deputies to consider and dispose of all labor matters relating to the coal-mining industry which would come in the ordinary course of business before the Fuel Administration, the decisions to be made being subject to the procedure prescribed in existing joint agreements.

The following statement of principles was made by H. A. Garfield, United States Fuel Administrator, at conferences at which were present Frank J. Hayes, president, John L. Lewis, vice president, William Green, secretary and treasurer of the United Mine Workers of America, and also John P. White and Rembrandt Peale of the Fuel Administration, all of whom acquiesced in the statement as expressing their understanding of the principles followed by the United States Fuel Administration and by the United Mine Workers in settling questions relating to labor in the coal-mining industry, it being understood that wherever the Federal Government is called upon to intervene or of its own motion intervenes in the settlement of such questions, whether in organized or unorganized fields, jurisdiction shall remain for the present and until otherwise arranged in the hands of the Fuel Administrator.

"The United States Fuel Administrator understands

(a) That no strike shall take place pending the settlement of any controversy until the dispute has been reviewed and decided by him.

(b) That recognition of the unions shall not be exacted during the continuance of the war except where now recognized by collective bargaining.

(c) That where, by joint contract between employer and employed, machinery is provided for the settlement of controversies, the United States Fuel Administrator shall not be required to intervene or to mediate until such means have been invoked and the remedy exhausted without reaching adjustment.

(d)) That where the United States Fuel Administrator intervenes, substantially, the principles, provisions and practices laid down in the Maryland and Upper Potomac Settlement of May 6, 1918, shall be accepted by the workers and employers and their chosen representatives as sufficient.

(e) On the basis of the foregoing understanding, which he regards as just and imperative in the present crisis, the United States Fuel Administrator has insisted and will continue to insist that any adjustment of labor questions in the coal-mining industry, whether by joint agreement between operators and mine workers or by agreements severally made with the United States Fuel Administrator, shall embody wherever applicable, and substantially, the principles, provisions and practices laid down in the Maryland and Upper Potomac Settlement of May 6, 1918, and recognizes the authority of the International Union of Mine Workers (sic) in the organized fields and their jurisdiction over controversies arising in said fields. More specifically, the United States Fuel Administrator has insisted and will continue to insist on all such settlements.

(a) That employers will be required to relinquish the right to discharge employees because of affiliation with labor unions.

(b) That employers will be required to recognize the right of their employees to organize by peaceful methods that do not interrupt production.

(c) That the so-called automatic penalty clause now in force, being regarded by mine workers as a cardinal principle of collective bargaining during the continuance of the war, will be included in all agreements as a condition precedent to the allowance of increased price permitted to operators.

(d) That where the union shop now exists, the same shall continue, and where union and nonunion men work together, the continuance of such condition shall not be deemed a grievance."

Exemption of West Virginia Miners

The production of high-grade coal such as West Virginia produces has caused the Provost Marshal-General to take action to prevent a depletion in the ranks of the mine workers. Local draft boards of the state have been given authority under the selective service regulations to exempt miners, and according to an announcement from the office of the Provost Marshal-General diggers of coal can now be placed in a deferred class.

The draft has demoralized the coal industry of the whole state, but especially of the southern half. Coal operators have hesitated to interest themselves in seeking the exemption of mine workers both for the broadest patriotic reasons as well from a desire to avoid even the appearance of interfering with the free action of their mine workers. They felt, however, that it was most important to get out coal and that it could not be mined and loaded without men.

It is now decided that in the future men employed in and about the coal mines of West Virginia will not be accepted for service in the army.

Major Stuart, of Huntington, in charge of recruiting for the army in West Virginia, received instructions from the War Department July 23 to discontinue all recruiting activities in the coal-mining regions and to scrutinize closely enlistment applications filed by mine workers. The following is a copy of the telegram Major Stuart received:

"It is reported essential coal workers being enlisted. Direct all your parties cease activities at once in or about coal-producing centers. Exercise greatest care in accepting any applicants who have been in any way connected with output of coal. Each case of a man who claims to have severed connections with such occupation with a coal company with no intention of resuming connections with such occupation must be carefully investigated by communication with former employer, and if it appears that the applicant has recently left such employ without the consent of the employer he should be rejected. The coal industry must not be interfered with through enlistment."

Reports received here from the coal-mining centers are to the effect that a number of miners are not working regularly and Major Stuart is making an investigation.

Operators and Men To Work Together*

By JAMES B. NEALE

Director of Production of the United States Fuel Administration

During the past month I have had interviews with and have received letters from many coal operators and labor leaders, and, as a result, I am firmly convinced that sufficient coal can be produced by the men, the development and the equipment now available, provided every man and boy from the highest official to the smallest trapper will put forth his very best effort. The operators and their staffs alone cannot do it; nor can the mine worker alone achieve it. It can only be done by the coöperation of both parties in interest, working hand in hand with grim determination to rid the country of the coal shortage, which may be confidently regarded as the greatest menace we face in the winning of the war.

The operators must work as they have never worked before. They must be in and about their mines, thus showing in a way which can be seen their deep interest in the Government's determination for increased tonnage. They must take up with their superintendents and mine bosses questions of efficiency and working conditions so that the best opportunities may be afforded to the workers. I am confident that much benefit will come if the operators themselves and their superintendents will keep inquiring of the mine bosses in regard to what can be done in order that the mine workers may produce more coal. The operator must take away from the mine workers every excuse for days absent or short-hours worked. The miners cannot work if pit cars are not furnished, if the miners are gassed out, if the colliery is wanting timber, etc. These small details must now assume large proportions and must be looked after with the greatest care.

The mine worker must report for work each day and must actually work his full eight hours and produce more coal than ever before. The mine worker is much more likely to do this if he sees that the mine management is making almost superhuman effort to enable him to work day after day under the best possible conditions. There is no doubt that in very many cases the miner has lost many days and has frequently worked short hours. This has caused a great loss of production. But, at the same time, there is also no doubt but what a large tonnage has been lost by the carelessness and inefficiency of the mine management.

This country is facing an exceedingly serious crisis. Increased coal production is absolutely necessary to success. The winning of the war then lies with coal operators and coal miners. There are two powerful controlling elements and one cannot work separate and distinct from the other. One element is the man power and the other is the owners, managers and superintendents. I am sure it will be an inspiration to the mine workers to see the operators with their coats off. The men about the mines should know the big boss. The director of a coal mine who does not direct is a menace to the country at this time. No matter how earnest a pit boss may be the edge is taken off his service when he sees that those above him are not interested.

The coal operator must not pass the buck to the men. Don't lay the blame altogether on the mine workers. Don't think things are just right and let it go at that—look into your operating conditions. Lots of days have been lost by mine workers for which they were not responsible. Results we must have and in such a crisis nothing is too petty to receive the personal attention of the mine owner.

*Abstract of address to Fairmont Country Club, but summarizing also some remarks made to a representative of "Coal Age."

PRAISED FOR THEIR EFFORTS, FAIRMONT OPERATORS ARE TOLD TO HELP THEIR MINERS PRODUCE COAL

EDITORIALS

Size of Shaft Pillars in Mines

A GLANCE at the many empirical rules now being used for the determination of the size of shaft pillars is enough to convince anyone that no considerable progress has been made in the science of roof breakage and subsidence. All we have learned is that somehow, when coal is extracted, the roof over the undisturbed mineral suffers with the roof over the disturbed mineral. That is something, of course. In fact it is much, because it lays entirely aside the assumptions that the roof breaks between the pillars or arches between them, or again chokes up tight because loosely piled fragments occupy a larger volume than unbroken measures. When we realize that the strata surrounding the shaft are mysteriously pulled apart by the destruction taking place around them, we part with all belief that the principle of shear explains roof failure.

Something, therefore, has been learned even if the formulas based on depth and coal thickness are not just exactly reliable; even though one authority insists on a pillar with about 100 times as many square feet as seems necessary to another; and even though Merivale would have the pillar for an 1800-ft. shaft only 165 ft. square, whereas Hughes demands one 1800 ft. in diameter.

Imagine the roof of the mine as a plate of iron. When it bends over the shaft pillar the point of maximum tensile stress will be over the heart of the shaft pillar, which is usually the location of the shaft. This will be the case unless the stiffness of the roof is insufficient to enable the iron to bend in a common arch over the shaft pillar. When the roof is weak, or the pillar large, the iron may sag in the center and form two folds over the pillar. Let us term the single arch an "anticline" and the dip into the excavated area a "syncline." The anticline may be as broad as the synclines on either side, provided the shaft pillar is wide enough to accommodate it. But if the pillar is too broad, there will be a sag on the top of the shaft pillar. The maximum breadth of the syncline is, of course, determined by the strength of the roof; in other words, its breadth depends on the number of feet that will stand unsupported. The size of the anticline is similarly determined, unless the pillar is smaller than the syncline. A shaft pillar just as wide, or less wide, than the breaking span of the syncline will tend to fracture on the top of the anticline or at the shaft location. Thus, if you want to protect the shaft, make its diameter larger than the breaking span. This span depends on the depth of the roof and not on the coal thickness.

Perhaps the size of the pillar should not be schemed so as to prevent surface breakage of the pillar at the shaft. That may be too rigid a requirement. We may content ourselves with requiring merely that the action at the shaft shall not be made too severe by the breaking of the roof over too narrow a pillar, for a small pillar will break the roof more severely than a large one. In the event that we are not solicitous about all breaks at the shaft, but only that the breaks shall be followed by only moderate movement, then we are justified in considering coal thickness; for the movement on breakage where the coal is thick is more considerable and the general distortion of the measures greater. The horizontal shears, for instance, are more marked where the roof is subjected to a greater depth of collapse. The tilting of the measures is also greater, for with a given length of tilting strata a greater tilt has to be afforded. As the span of an unbroken roof varies with numerous indeterminable strength factors in the roof material, it is hard to say offhand how big a shaft pillar should be. The experience of mines in the neighborhood is the best criterion, especially if the manner of working is uniform.

The thickness of the coal has little to do with the problem if you intend to support the roof over the whole area mined, as in Illinois; or if, as said before, you intend to make the shaft pillar so big that the breakage cannot reach the shaft or adjacent buildings.

Reclaim the Sulphur

"THE peaceful ages of history have seldom been the productive ones." War causes many rude awakenings. A few months ago most people considered this country almost, if not entirely, self-supporting. Of course, it was recognized that certain articles of commerce and consumption—such as tea, coffee and rubber—necesssarily could not, on account of climatic conditions, be produced in continental United States. But of minerals we believed that we possessed an abundance of all except the more rare ones, such, for instance, as vanadium and molybdenum. Few, if any, of the ordinary run of people ever dreamed that even under the stress of war we would face a shortage of such a common substance as sulphur.

However, a shortage in sulphur has developed, and it has already assummed such proportions that the Government has commandeered the supply, both as to stocks and mines. The existing sulphur mines of Louisiana and Texas are being worked to capacity, and the stocks accumulated in past years are being drawn upon heavily. It is essential, therefore, that additional sources of sulphur be found, and found quickly.

At present sulphur is secured from the reduction of pyrite ores and from smelter gases, but the amount thus available is not sufficient to meet the present demand. Probably at least half a dozen "peace" industries, as well as the vast explosives program necessitated by our participation in the world war, demand the use of sulphur. Thus the rubber industry, the manufacture of news print paper, fertilizer, and the manufacture of storage batteries require the use of sulphur either raw or

in the form of acid. Black gun or blasting powder contains ground sulphur as one of its three ingredients, while smokeless powder almost universally used as a propulsive for military projectiles requires sulphuric acid for its manufacture. The same is true of gun-cotton, piric acid, dynamite, nitroglycerin, lydite, cordite, trinitrotoluol and tetranitrophthalein.

Sulphur is in nature fairly widely distributed. It occurs free in certain localities, the largest and best known of such deposits probably being that in Sicily. It also occurs combined with iron and copper in the form of pyrite. This mineral is found in many regions and is probably the most widely distributed of any of the natural sulphur compounds. The "sulpur diamond," with which people in the anthracite region are familiar is a crystalline form of pyrites, while the "brasses," well known to miners of bituminous coal, are formed of the same material.

Brasses, as is well known, are a detriment to any coal. The presence of sulphur in coal always tends to produce clinker on combustion. In metallurgical processes sulphur in the fuel is liable to unite with the metal being treated, rendering it impure and not suited to certain purposes. Thus high-sulphur coke produces a hard, brittle iron much inferior to the purer product made with low-sulphur coke or charcoal. Furthermore, brasses or a high sulphur content in coal exert a potent although possibly an imperfectly understood influence upon the spontaneous heating and possible ignition of the coal when stocked.

In certain localities and in certain coal beds brasses are much more numerous than in others. In some beds in Novia Scotia, in West Virginia and in Illinois pyrite in one form or another is found in such quantity as to be ordinarily considered a nuisance. If, as is often the case, this mineral is found mixed with coal from which it cannot readily be separated, the mixture will not stand shipment for any great distance on account of its liability (almost certainty) of firing upon exposure to the air.

A means or rather process has been devised whereby sulphur may be extracted from coal brasses. The equipment necessary is comparatively simple and inexpensive, and it would appear that the erection of a plant for the recovery of sulphur would be commercially justified wherever pyrite in sufficient quantity may be secured from a mine or group of mines.

The treatment to which the pyrite is subjected, known as the thiogen process of sulphur reclamation, is comparatively simple. The pyrite is roasted or burned, forming sulphur dioxide gas. This is then mixed with a certain proportion of fuel gas (either natural or producer gas) in a reaction chamber containing a catalytic mass. The sulphur in the gas is thus liberated and condenses or sublimes in an extension or cooling chamber. By this means practically pure sulphur is secured from a waste mine product. Under reasonably favorable conditions it is estimated that the cost of producing sulphur by this process should not exceed $7 per ton, about 2½ tons of pyrite being consumed per ton of sulphur produced.

It has been estimated that in the coal fields of the United States it would be possible within a few months (necessary for construction) to produce by this process 1000 tons of sulphur per day. While this would not be sufficient to anywhere near meet current demands, it would help greatly in that direction. Furthermore, the reclamation of a valuable product from what has heretofore been considered a nuisance, a necessary evil, and a waste, is a step in the right direction. This is true conservation.

Railroads Make Raid on Production

THE PUBLIC is disposed to make snap judgments. Last winter, when it found itself short of coal, it blamed the producer and Dr. Garfield. Then slowly it veered round to the idea that the railroads were to blame, and so it condemned the railroads and Dr. Garfield. But now the Government has the railroads, and there is a strong disposition to argue that they must therefore be more efficiently run than when in private hands; and as evidence accumulates that the production of the mines now but barely exceeds the capacity of the car service, the public is beginning to chide the operator and Dr. Garfield—always Dr. Garfield, be it noted—for the coal shortage, past, present and prospective. The operators and Dr. Garfield are accused of not being forehanded. The public asserts that their production campaign was not started early enough.

As a matter of fact, they have been forehanded. They started their hue and cry just as soon as it seemed possible that a car supply adequate to justify their campaign might somehow materialize, if only for a few brief weeks. The operators and Dr. Garfield talked production so long, loud and persistently to the miners left them by the draft and by the labor recruiters that they were overheard by the public. The public shook its head, said these lectures showed something was wrong, and if something was wrong why had it not been corrected before?

The public always acts in this illogical manner. No one can convince the dear people that anyone has ever shown any judgment or foresight. When the railroads were day after day laying the mines idle no one could talk production without exasperating the miners. No employer can scold his men for being idle when no work is provided. At some places he cannot scold today with any good grace.

We wager it is not an easy matter to preach a large production in the Hazard field in Kentucky, where in the week ending June 29 production was 36.5 per cent. short of capacity because of car shortage. The week following it was still 20.7 per cent. short. How would the average American take to a lecture on working hard and steadily if he was only allowed to operate his factory four or five days a week? The car shortage in those two weeks was in the Fairmont region of West Virginia 28.4 per cent. and 9.9 per cent. respectively. In northeastern Kentucky it was 19.8 per cent. and 8.5 per cent. In the Westmoreland field it was 16.6 per cent. and 6 per cent.

It is always difficult to make preparations for a prospective psychological condition. Propaganda to be popular and appear practical must have reference to an existent, not to a hypothetical, condition. If for months men have been working short time and have been highly incensed at that fact, it is hard to lecture them on the duty of working steadily without giving offense; and it is extremely hard to swing them into line when con-

DISCUSSION BY READERS

Travel of Electric Current

Letter No. 2—Referring to the inquiry of "Student," *Coal Age*, July 6, p. 35, permit me to suggest that experiments have proved that direct-current electricity permeates the entire body of the conductor, which is not the case with alternating current. In alternating-current practice, there is what is termed a "skin effect" in the conductor. This term is used to describe the condensation of the current on or near the surface of the conductor.

To one who cares to investigate, it will be of interest to see how the character of these two kinds of current has been provided for in the construction of the bus bars of switchboards, for direct and alternating current. In the former instance, when direct current is used the bus bars are made solid, while in the latter they are constructed in the form of tubes.

The higher the frequency of the alternating current, the thinner the walls of the tubes may be made, which shows that a tube having the same outside diameter as a solid rod or wire will carry the same current, under the same pressure, in alternating-current practice.

Camp Jackson, Columbia, S. C. W. J. GRAHAM.

Letter No. 3—In the issue of *Coal Age*, July 6, p. 35, "Student" asks whether an electrical current flows over the surface or through a wire conductor.

Little is known of the real nature of electricity, and we must judge of its action by the effects produced. We read of a current flowing in or through a conductor, and, while it is natural for the mind to picture to itself a material quantity of something we call "electricity," one quickly realizes that the idea finds expression in the thought only. Experiment has enabled us, however, to determine the strength of an electric current or the so-called quantity of flow, and to measure the electromotive force and determine approximately the velocity of a current flowing in a conductor.

These measurements, however, throw no particular light on the mode of transmission, except as pointed out in the editorial reply to this question, where it is shown that the allowable current capacity of a conductor, as determined by the heating of the wire, bears such a relation to the diameter of the wire as to suggest that the entire mass of the wire is affected.

STATIC CHARGES DIFFER FROM VOLTAIC ELECTRICITY

It would seem that the idea of a current flowing over the surface of a conductor, rather than through the body of the wire, originated from experiments on *charged* bodies. These experiments showed that an electrical charge resides upon the surface of such a body. For example, when a metal cup is placed on an insulating stand and charged with electricity derived from an electrical machine or other source, there is found to be no effect produced if a metal rod or ball is brought in contact with the inner surface of the cup. If, however, the ball or rod is brought into contact with the outer surface of the cup it at once becomes charged.

While this is true of a static charge of electricity, it does not prove that a similar condition exists in respect to a current passing in a conductor. The two forms of electricity known as "static electricity" and "dynamic" or "voltaic electricity" may differ materially from each other, and what is true of a charged body is not necessarily true of a conductor through which a current is flowing. The distinction between *positive* and *negative* electricity, as being divergent elements, does not appear to affect the status of current electricity in the same degree or sense as characterizes a static charge. It may be stated with much truth that what we do not know about electricity far exceeds our knowledge of the subject.

A CURIOUS CONCEPTION OF ELECTRIC FLOW

One modern view, which has not received any general acceptance, however, is the suggestion that an electric current does not flow through a conductor or over its surface, but passes through the ether or other dielectric surrounding the conductor, the idea being that the so-called wire conductor merely forms a sink where the electrical energy dissipates itself and, in this capacity, acts to direct the current.

Such a theory, however, does not appear to lend itself to the observed and established laws of electricity. Practically, the current capacity of a wire conductor is determined by the heating of the wire, which first shows a dull red glow and, as the strength of the current increases, the wire becomes quite hot, the degree of heat often reaching the melting point of the wire. It is safe to say that these characteristics or effects do not support the idea that the current flows over the surface of the conductor only. ELECTRICAL ENGINEER.

Windber, Penn.

Heat Treatment of Axle Steel

Letter No. 1—In connection with the recent letters relating to different phases of mining equipment, allow me to indorse the statements of P. K. Howard, *Coal Age*, Apr. 13, p. 710, by which he calls attention to the importance of the heat treatment of mine-car and locomotive axles.

As Mr. Howard has said, this is a matter that has not been given much thought by the average mine official, who seldom stops to consider, if he really knows what is the kind of axle steel best fitted for mine-car running gears. As a general rule, this kind of material is bought from a price standpoint. No thought is given to the analysis, tensile strength or hardness of the steel. Also few seem to realize the great advantage of using a heat-treated axle. This latter may cost a few cents

a pound more than the ordinary soft steel, but it will pay for itself many times over in a short time.

By heat-treating an axle of, say 0.40 to 0.50 per cent. carbon content, a tensile strength of about 125,000 lb. per square inch is secured with a hardness of about 40 on the scleroscope scale. The same analysis steel, cold-rolled, gives a tensile strength of about 80,000 lb. per square inch. The advantage in using as hard and as tough a steel as possible is self-evident when the extremely hard usage of mine-car service is considered.

By using heat-treated axles, bent and broken axles may be eliminated. This item itself saves considerable blacksmith and car-labor expense. Then, again, when a heat-treated steel is used it is found that wheel hubs are not enlarged to such an extent as when a soft axle is employed. Also, the axles themselves do not wear down as much as is usually the case.

I know of one large anthracite mining operation that has been using heat-treated steel for axles for the last seven or eight years. When this company was using ordinary soft steel it sold from one to two car loads of scrap axles every year, but since using heat-treated axles it has not scrapped one car load. These axles have also shown a decided saving in shop labor.

Another place where a good grade of steel is necessary is in anti-friction running gear. As mine operators become more and more convinced of the advantages of an efficient anti-friction running gear, they also realize the advantages of using a good grade of axle steel.

Kingston, Penn. E. A PEARSON.

Electric Mine Haulage

Letter No. 1—Having had a number of years' practical experience as a motorman and in the construction of almost every type of locomotive used, and being familiar with the various conditions met in mine haulage, and knowing the kinks it is often necessary to adopt to secure the best results, the discussion, in *Coal Age*, regarding the different types of locomotives in use, has greatly interested me. I agree with Steven D. Otis, who suggests, June 15, p. 1124, that "practical mining men should . . . give their experiences." It is true that the present is no time to hoard up knowledge that will advance the common interests of the coal-mining industry.

Mr. Otis gives a very interesting description, in his letter, of the succession of improvements that followed the displacement of mules by mechanical haulage, in a Pennsylvania mine of which he had charge. In the course of his letter, he brings out some interesting points in regard to the practical operation of storage-battery locomotives on main haulage roads, by the use of roller-bearing instead of plain-bearing cars.

CONDITIONS DETERMINE TYPE OF LOCOMOTIVE

Experience has long since convinced me that the question of replacing mules with gathering locomotives must be governed largely by conditions underground, and that each installation must be studied separately and decided in accordance with these conditions. The flexibility of the storage-battery locomotive and its adaptation for gathering purposes cannot be denied. However, as stated by "Motorman," in an interesting letter, Apr. 27, p. 800, there are conditions under which better results are obtained by the use of the cable-and-reel type of locomotive.

The recent development of the cable-and-reel locomotive and its combination with the crab type presents many advantages over the original design. Scarcely a year ago I installed several locomotives of this type, which have proved very satisfactory. These locomotives were installed both for gathering purposes and main haulage. The claim of greater capacity, reliability and convenience was what led to the installation.

CRAB-AND-REEL REPLACES STORAGE-BATTERY TYPE

No one will claim that any one type of locomotive is suited to all conditions alike. In one instance that I recall, a large coal-mining company replaced the storage-battery locomotives, which they were using on their gathering hauls, by locomotives of the crab-and-reel type. They had used the battery locomotives for a considerable time but found that better results could be obtained, under the conditions existing in their mines, by employing the cable-and-reel machine. The result proved the wisdom of making the change. I might cite other instances to show that the service conditions of different types of locomotives are being closely studied today and improvements in the structural and electrical details are being constantly made. On this account, the characteristics of the different types of machines are growing in importance each day.

Someone has stated that the storage-battery locomotive is easy to operate. It must be remembered, however, that the operation depends almost wholly on the experience and skill of the motorman. As has been pointed out by the writer who signs himself "Storage Battery," June 1, p. 1028, an unskilled motorman or the use of bad rolling stock will quickly drain the batteries and render this type of locomotive inefficient. The same writer closes his letter with the statement that "the success or failure of any gathering haul depends almost entirely on the condition of the track, the kind of mine cars and locomotives and the knowledge and skill of the motorman."

SUCCESSFUL STORAGE-BATTERY INSTALLATION

The following citation in my own experience may prove of interest in this connection: Not long ago, I installed, in a large mine, a General Electric storage-battery locomotive of the two-motor, 5-ton type, equipped with 80 Edison storage batteries. The charging equipment consisted of a 10-kw. motor-generator set and switchboard.

Alternating current is supplied, at this mine, from a high-tension system, of 2200 volts, primary, and 220 volts secondary, the latter being used for operating the alternating-current, coal-cutting machines. The motor-generator set was used to convert the 220 volts of alternating current into 250 volts of direct current, which was used for charging the locomotives, this current being regulated by the rheostat on the charging panel to the proper charging voltage. The charging current of this equipment is 60 amp., at 110 volts. The arrangement is such that the battery is automatically cut out when fully charged. In my opinion, where alternating current is available, this equipment is the most nearly ideal system of gathering or main haulage.

The storage-battery locomotive was used on the main haulage road, for hauling the coal to the slope bottom. On July 3, I hauled 413 tons of coal in eight hours with this locomotive, which could have hauled 500 tons of coal, in that time, had the coal been available. During the noon hour, from 12 to 1, the batteries were boosted. In this mine, the grade on the main haulage road is in favor of the loads, but the mine cars are equipped with plain bearings.

T. O. HUGHES,
Windber, Penn. Mining Electrician.

Safety in Shotfiring in Mines

Letter No. 6—It would seem that the subject of securing the greatest safety in the firing of shots in mines has been discussed from almost every angle; and, yet, it appears to me that sufficient emphasis has not been placed on the more general use of permissible explosives.

It is but a few years ago that the matter of testing explosives used in coal mines was taken up by the Federal Government. At a great outlay of labor and expense, the Government has since conducted tests on the different explosives submitted to them by manufacturers as designed for coal-mining use.

Besides making careful tests of these explosives and preparing a list of those powders that passed the test and were therefore considered safe to be used in the mining of coal, the engineers of the Government went further in their investigations of the characteristics of different explosives and the elements involved in the blasting of coal that tended to make the work dangerous. These investigations enabled the engineers to recommend safe practices both in the manufacture and the use of explosives.

BLACK BLASTING POWDER VS. "PERMISSIBLES"

When one considers the universal use of black powder for the blasting of coal in mines and the large number of accidents that have resulted from that cause, the work undertaken by the Government appears almost revolutionary in its character and extent. The movement, however, met with great opposition from large numbers of miners and the adoption of the so-called permissible powders, in many mining districts, has been slow indeed. It required much exploitation to educate the miners to the proper use of this new class of explosives, and to convince them of the greater safety secured by their use.

While the movement has proved successful in the more important coal-mining states and districts, there are still many mines and miners throughout the country that continue to use black powder for the blasting of coal. Recently, a couple of our old miners who had been absent for some time returned and asked for work. They stated that they liked the work and were given good places where they had been. They said their only reason for returning was the fact that the miners in those mines were using black powder. These men had come to know the greater safety of permissible powders and could not be induced to remain where black powder was used in the mine.

The habit of using permissible powders is a good one, and there is no reason why there should any longer be any hesitancy of miners in adopting these powders. It is my opinion that the Government should now take active steps to make their use more general, as it is one of the important features of coal mining, in respect to safety and economy. It is my belief that there is not a seam of coal that cannot be effectively blasted with permissible explosives. I have witnessed the best results obtained where it had been contended that permissibles would prove an absolute failure.

Where permissible powders have been tried, and failed, the result is commonly due to a misuse of the powder, either in the weight of charge employed or in the grade of powder used. The mistake is frequently made, also, of failing to properly tamp the hole. Permissible powders should be thoroughly tamped to the mouth of the hole, and the same care must be exercised in their use as in blasting with black powder. The idea seems to prevail among many miners that, because permissible powders are quicker and stronger than black powder, they do not require the same tamping, but this is a mistake. All holes should be well tamped to secure the best results and insure success.

W. H. NOONE.
Thomas, W. Va.

The Mining Situation

Letter No. 6—I have been greatly interested in the discussion of the present situation in the coal-mining industry, and particularly in the letter of my friend, R. W. Lightburn, *Coal Age*, July 13, p. 78. I do not feel, however, that all the blame should be placed on the miners. Neither are the operators wholly to blame.

A great responsibility rests, at the present time, on the mine foreman, whose duty it is exert himself more than anyone else in the mine to keep things moving. An instance that came under my observation but recently leads me to think that in a number of cases where the mine's output is delayed the blame rests on the foreman in charge.

While there are many good, loyal foremen who are doing all in their power to increase the output of their mines, it must be admitted that there are foremen who are only too willing to lay down on the job. They realize that they cannot be held accountable for the mine not running when they are able to offer the excuse that "only half of my men showed up this morning, and we were forced to shut down." The instance to which I refer as illustrating this disposition on the part of some foremen to neglect their duties is the following:

WHERE THE MINE FOREMAN WAS TO BLAME

A few mornings ago, the miners who worked in one section of the mine where the roof was bad and the roads none too well timbered found, on reaching their places, that a heavy fall of roof had occurred during the night, blocking the road. It was evident that some time would be required to clear up the fall so that coal could be hauled. The miners were on the point of going home, when I and a few others volunteered to have the road cleared in a short time if the diggers would stay and load out their turn, which they agreed to do.

In a short time the track was cleared, but many of the timbers were so badly broken that it was considered dangerous to use the road for hauling, until new timbers could be put in place. Not to throw the mine idle,

however, the driver agreed to take the chance that day and haul the coal, provided the mine foreman would have the place properly timbered the following night. To this the foreman quickly agreed, and the mine ran that day as usual.

But the following morning the road was found to be in the same condition as the day previous, and another small roof fall had occurred. The driver now flatly refused to haul coal another day with the road in that condition. His action forced the men working in that section to go home for the day, with the result that, of the twelve men who went home only three returned the following day. Four of the men did not come to the mine again for four days, and three of them were absent for two days, while two quit the mine altogether. Thus, there being but three men in, the machine crew also quit.

The incident I have related shows gross incapacity on the part of the mine foreman. As a result of his failure to have the necessary work performed the first night, according to his agreement, that section of the mine, in the following two weeks, produced only 200 tons of coal. Ordinarily there would be produced in the same section 125 tons of coal a day, all of the men working there being good miners.

The Result of the Foreman's Failure

As a sequel to this incident, it may be said that the mine foreman embarrassed his own position. He could not discharge the men who stayed out and did not return to the work promptly when the place was made safe. Such action by the foreman would have led to an immediate investigation by the union, and would have resulted in showing that the mine foreman was himself to blame. He was wise enough to know this and so patiently waited for his men to come back to work. In the meantime, however, the output of the mine was greatly reduced.

As has been stated by a writer signing himself "Loyalty," *Coal Age*, July 13, p. 78, the time has come when "slackers should be brought to feel their responsibility in the great cause, by drastic action of the Government." It is just as important to conscript men to produce food and coal as it is to conscript men for the army.

I am myself under the draft law and will probably be in service this month or the month following. The ruling of the Government compels every man to "work or fight." But a man who works but two or three hours in each shift, when he could employ himself full time, is a slacker of the worst sort, and it would seem that these men are being humored, while many brave hearts fighting at the front are suffering from their neglect. To my knowledge, there are ten of these fellows, hereabout, who have never bought a Liberty Bond or a War Savings Stamp. They tell me they cannot afford to do so, although they are drawing from $100 to $125 each pay.

Here, in the summer, we are face to face with a shortage of coal, and what can we expect the coming winter? The situation calls for serious thought, and measures should be taken at once to avoid what is plainly in store for us if the mining of coal continues at the present rate.

I fail to understand the suggestion made by R. W. Lightburn, July 13, p. 79, namely, to work two 6-hour shifts a day. It certainly would not be feasible to work six hours, then rest six hours, work six hours again and rest the remainder of the time in every 24 hours. Perhaps he means to run two separate crews each working 6-hour shifts. Such a plan would present many difficulties, however, and not the least would be to get the men.

My suggestion is to place competent men in charge of each section of the mine who will be responsible for the blasting and loading of the coal in their section. I believe this plan would be feasible.

Cleaton, Ky. Ostel Bullock.

Letter No. 7—The letter of Thomas Hogarth, Coal Age, June 29, p. 1208, draws attention clearly to an important feature in the coal situation. According to the estimates of the Government, there will be a shortage of 55,000,000 tons of coal next winter, which is an appalling proposition. The suggestion Mr. Hogarth makes, regarding the appointment of a Government inspector having authority to check up men who are not regularly on the job, appeals to me as a good one.

A large proportion of the miners working in Colorado are single men; at least that is the case in the district where I am located. It is a fact, also, that the Colorado miner makes as good if not better pay than miners in any other state. These conditions have developed an abnormal tendency in our miners to take vacations. With the increase of pay the shortage of labor here has increased to a startling degree.

It was hoped that the "work-or-fight" order which went into effect recently would prove to be the much needed remedy for holding men in their places. As a matter of fact, however, few cases have come to my knowledge where the idleness of workmen has been investigated. As before, it is the married men who stay on the job, with little loss of time.

The week point in the situation is the fact that when a man wants to lay off for a time, all he has to do is to quit the mine. He knows full well that it will not be difficult for him to get work again at the nearest mine when his money is spent. Thus, an army of competent men whose services are badly needed by the Government are only producing from one-half to two-thirds of the amount they should. The balance of their time is spent in wandering from place to place or is passed in loafing in the saloon.

Questioning Miners Who Quit

For my own satisfaction, I carefully questioned all of the men who left our mine recently. My desire was to ascertain the cause of their leaving. Very few cared to give or could give any satisfactory reason for leaving. Most of them did not try. Some said they "wanted a change," while others "wanted a rest," adding that they "might be back later on."

No doubt Mr. Hogarth's "Government inspector" could easily check up the idleness of men who were not in their places, and this would have a good effect. It would be difficult, however, for such an inspector to ascertain how much time was spent in idleness by men who quit their places in one mine to seek work elsewhere; or to ascertain how long men applying for work had actually been idle.

In order to compete with this feature of the situation some such special means would have to be adopted, as I believe has already been mentioned in the columns of

Coal Age, of giving discharge cards to men leaving a place, and requiring them to show such cards of honorable dismissal when applying for work in another place.

Allow me to draw attention to the fact that the loss in production, due to the idleness of miners, is not the only loss to the mines. There is a very considerable loss in the efficiency of operation when men are constantly coming and going in a mine. Newcomers must become familiar with their places and the conditions surrounding their work before they can show the same efficiency as in the mine they left.

Delay Caused by Breaking In New Men

A new man may be a first-class timberman, but someone must go around with him to show him the places where he is to work, until he knows the roads and can find them himself. A new driver must drive with caution until he has learned his runs. Likewise, an experienced miner must learn the local conditions in a seam before he can load his usual amount of coal each day. A new man going into a strange place must spend a day or more in fixing up his room ready for work. These changes cause much delay and are a positive loss in the production of coal.

All will admit that any law forbidding a man to quit his work when he wishes would be unjust, except as a military measure. The needs of the Government, however, must be the first consideration and the rights of miners to come and go, at this time, may be properly questioned. It may also be a question whether a miner has the right to choose the place where he shall work, as long as this right of choice conflicts with the duty and obligation of the citizen to his country. A soldier has no right of choice in his service but must go where and when he is ordered. If the work of mining coal was subject to the same restrictions during the period of the war, there would not be the loss of efficiency in the mines and the shortage in production that there is at the present time.

M. M. Watson.

Floresta, Colo.

Sealing Off Fire on Intake

Letter No. 8—In the issue of *Coal Age*, June 22, p. 1173, "Ancora" asks for the best method of extinguishing a fire that has gained so much headway on the intake of a pair of entries driven in solid coal that it is thought best to seal off the fire by building air-tight stoppings.

The sketch given in connection with this inquiry does not show whether these are the main headings driven from the shaft or a pair of cross-entries. In the former case, there is little opportunity of preventing the fire from reaching the upcast shaft, or even to give warning to men who may be in danger, since the smoke and gases from the fire are traveling at the rate of 500 ft. per min., that being the velocity of the air current, in this case.

Having warned the men in danger, immediate steps should be taken to short-circuit the air, at a point outby from the fire, by opening a door or tearing down a stopping as near to the fire as possible. This being done and the material being on hand, I would endeavor to erect a temporary brattice, with shiplap or boards, in the return airway, just inby from the crosscut opened.

On entering the return airway it might be necessary to use men equipped with breathing apparatus, in order to avoid their being overcome by the smoke and gases generated by the fire. The temporary stopping should be set far enough back from the opening to permit of the building of a permanent brick or concrete stopping between it and the crosscut. Do not complete the building of the temporary stopping, but leave it open the width of one or two boards from the roof and hang a piece of canvas over this opening.

In the meantime, a similar temporary stopping should be built, at a corresponding point on the intake airway, and carried up to near completion, as before. Now, close the opening in the return stopping with boards, and at once do the same on the intake. The work of building the permanent stoppings should be commenced immediately after closing the two temporary stoppings. This work should be performed as quickly as possible, the two stoppings being carried to the roof and tightly sealed with clay or mortar.

In building the permanent stoppings, it is important to cut into each rib and the roof and floor a sufficient distance to enable the forming of a tight joint. Safety lamps should be used in performing the work, and the thickness should be such as to give the stopping sufficient strength and make it safe. It is customary to build in a pipe in each stopping, at a point near the roof, for the purpose of ascertaining, from time to time, the condition of the air in the space inclosed.

Condition of Air Behind Stoppings

In answer to the second question asked in the inquiry, if we assume that the first stopping was built on the intake, the air behind that stopping would contain much carbon monoxide (CO), owing to the limited supply of air to the fire causing incomplete combustion. Such being the case, it would be a grave question whether it would be possible to build the return stopping.

My experience at a mine fire that occurred at Nokomis, Ill., May 20, 1918, makes me think that the heat of the fire would result in a considerable fall of roof, which would cover the burning coal and timbers. This was particularly troublesome at the Nokomis fire. But it is estimated that a cubic foot of wood (larch) is capable of producing 31.4 lb. of carbon monoxide (CO), which, at ordinary temperature and pressure, would occupy about 420 cu.ft. of space. This suggests what might be the condition in a limited air supply.

On the other hand, in answer to the third question asked, if the return airway is closed first, the gases formed behind the stopping will be mostly carbon dioxide (CO_2); and these gases, being extinctive and rolling back on the fire, would tend to smother it. There would be less chance of ignition and explosion of the gases taking place, and the work of building the stoppings would be safer.

Thomas English,
Springfield, Ill. Supt., Mine-Rescue Station.

Letter No. 9—[This letter, presented by W. H. Detty, Wilburton, Okla., gives the same method of procedure in extinguishing the fire by building stoppings as has already been described by Matthew Stafford, in Letter No. 6 of the last issue of *Coal Age*, page 188, which it will not be necessary to repeat here.—Editor.]

INQUIRIES OF GENERAL INTEREST

Cause of Brittleness in Mine Rails

Kindly permit me to draw attention to a statement made in a letter by "Trackman," July 13, p. 77. In speaking of the brittleness of rails used in electric mine haulage, the writer of the letter says, "The electric return acts upon the rails to make them brittle." I have read elsewhere the same claim that mine rails are made brittle by the action of the electric current, which passes through them on its return.

Permit me to ask if it is not an open question as to whether the electric return has the effect to make rails hard and brittle. I believe that it is the opinion of most all electrical engineers that the electric current has nothing to do with making the rails hard and brittle; but that this is brought about by the constant hammering that the rails receive from the locomotives and mine cars passing over them. Such a reason seems to me far more credible than the one we often hear advanced in regard to the effect of the electric return.

If it is possible to throw any light on this question, that will help to correct wide-spread opinions, it will be greatly appreciated by readers of *Coal Age*. The question appeals to me as a good one for discussion by electricians, who alone are able to give an intelligent opinion. Let us hope for a good discussion.

C. J. CREVELING, Gen. Supt.,
Blackwood, Va. Blackwood Coal & Coke Co.

Through the kindness of Carl Hering, a consulting electrical engineer of Philadelphia, Penn., and a recognized authority on electrical matters, to whom this question was submitted, we are enabled to present the following information regarding the probable cause of brittleness developing in mine rails. Dr. Hering writes as follows:

"Existing knowledge on the possible effect of the electric current to produce brittleness in steel rails is apparently not yet conclusive and definite. There is little doubt in my mind that the factor of degree also enters the problem, that is to say, certain physical actions will have no effect if they fall below a certain limit, while above that limit a decided effect is produced. A familiar illustration of this is the deformation that takes place when a piece of steel is stretched or bent beyond its limit of elasticity, while, on the other hand, the hair-spring of my watch has, for nearly thirty years, been subjected to reverse strains at the rate of five times a second, without the slightest change taking place.

"The claim has not been demonstrated conclusively that an electric current produces brittleness in the conductor. If true, the effect would probably be worse with alternating than with direct current—and would be small with low-current densities.

"The fact is well known, however, that the electric current exercises a crushing effect on a conductor, which effect I described many years ago under the name of the 'pinch effect,' by which name it is now generally known. This force can become very great, but I think it doubtful whether it would ever exceed the elastic limit of steel, except in the case of occasional high-current rushes that might act like a physical blow on the metal, as this force increases with the square of the current flowing in the conductor.

"Besides the pinch effect, I maintain that the electric current produces also a 'stretching effect' in the conductor; while I feel sure this is true, I do not know that my claims in this regard, published some years ago, have been generally accepted. Quantitatively, like the pinch effect, this force increases with the square of the current. But, since magnetization of *steel* produces molecular stresses, it is quite possible that brittleness may arise from this cause in the steel used in mine rails. There is what is known as the 'aging' of steel in transformers, but I am not sure that this includes any pronounced brittleness.

"Regarding the suggestion that the brittleness of rails is caused by the 'pounding of the cars,' allow me to say that the normal action of car wheels is a *rolling* and not a pounding one. The latter takes place only at joints and where dirt accumulates on the rails, or is caused by flat wheels, and is the exception and not the rule. In the passage of cars over the rails, the rails are subjected to an action somewhat similar to that produced when steel is cold-rolled, in a mill. That process, we know, produces hardening and perhaps a degree of brittleness.

"Experience shows that some steels will stand this crushing action by rolling, while others will fail, which shows that the *quality* of the steel in the rails is an important factor. For example, to take an extreme case, we know that a cast-iron rail would go all to pieces if subjected to the rolling action alone. Therefore, as the quality of the steel approaches that of cast iron, the rolling action of the car wheels will no doubt have a greater effect to produce brittleness than in steel of a quality which will stand this treatment.

"I regret not being able to give you a more direct and satisfactory answer To use a mathematician's expression there are many variables involved that affect the results. An approximately direct answer would be about as follows: If the current density in the rails is low, and there are not too many current rushes, the *electrical effect*, is probably *nil*. The *magnetic effect*, with alternating current, might produce brittleness, though this is not certain. The *pounding* of the car wheels on the rails is too local and exceptional to be the cause; but the resulting brittleness observed in the rails arises probably very largely from the rolling action of the car wheels, which, as I have said, resembles the action when steel is cold-rolled in a mill. Lastly, the *quality* of the steel is probably the most important factor in the development of brittleness in rails.

EXAMINATION QUESTIONS

Mine Foremen's Examination Wilkes-Barre, Penn., Apr. 23, 1910

(Selected Questions)

Ques.—What can you suggest for the reduction of accidents from falls of top rock, slate and coal, at the working places?

Ans.—To avoid accidents from these causes, the mine foreman and his assistants should visit all working places at frequent intervals, while the men are at work, and observe carefully that the place is well timbered and there is no loose top or coal that may fall. Strict regulations should be made and enforced, compelling every man to inspect his place when going into it in the morning and to set any needed timber before startting to load his coal. Miners must be instructed to set sprags when undercutting the coal. If a foreman or his assistant finds a place unsafe for work, he must withdraw the men until the place is made safe.

Ques.—Name and describe some of the important differences between the Davy, the Clanny and the Wolf safety lamps.

Ans.—In the Davy lamp, commonly used by firebosses when testing for gas, the oil vessel is surmounted by a wire-gauze chimney, which is generally protected by a metal shield on one side of the lamp. There is no glass cylinder surrounding the flame.

In the Clanny lamp, the oil vessel is surmounted by a glass cylinder that surrounds the flame and permits the lamp to give a better light than is possible with the Davy. The glass cylinder is surmounted again by a wire-gauze chimney, which is shorter than that used in the Davy lamp and frequently surrounded by a steel bonnet to protect the flame of the lamp against strong air currents.

The Wolf lamp, in common use as a working lamp, has practically the same form of construction as the Clanny lamp. One particular feature of this lamp is that the metal bonnet surrounding the gauze chimney is corrugated and has a number of tangential openings for the passage of air, which afford good protection against strong air currents. The distinguishing feature of the Wolf lamp is that it is designed to burn a volatile oil, such as naphtha benzine. The oil vessel is of pressed steel and filled with absorbent cotton to reduce the explosiveness of the oil. The lamp is equipped with a self-igniter.

Ques.—What dangers may arise from the improper assembling of a safety lamp?

Ans.—The improper assembling of a safety lamp means that one or more of the parts have been omitted or the several parts have not been accurately fitted to each other. In each case there is opportunity for the burning gas to pass between the imperfectly fitting parts and ignite the gas-charged air surrounding the lamp when the latter is exposed to gas in the mine. In other words, the flame of the lamp is not isolated from the outside atmosphere, and the lamp is no better than an open light.

Ques.—A slope measures 4.6 in. in length, on the mine map; the tidal elevation at the top is +780 ft., and at the bottom +530 ft.; what is the length and grade of the slope?

Ans.—Assuming the map is drawn to a scale of 100 ft. per inch, the horizontal length of this slope is $100 \times 4.6 = 460$ ft. The difference of elevation between the bottom and the top of the slope, or the rise of the incline in 460 ft. of horizontal distance, is $780 - 530 = 250$ ft. The length of the slope is found by extracting the square root of the sum of the squares of the horizontal distance and the vertical rise. Thus

$$\sqrt{460^2 + 250^2} = 523.5 \text{ ft.}$$

The grade of the slope expressed as the vertical rise per horizontal distance is 250 : 460 or 1:1.84. The percentage of grade, or the rise per 100 ft., is $100 \div 1.84 = 54.3$ per cent.

Ques.—What precautions would you suggest to guard the employees in a mine from possible accident due to the use of electricity?

Ans.—All electrical installations should be made by a competent mining and electrical engineer. The power line and trolley, as far as practicable, should be kept off from travelingways. At all points where it is necessary for men and animals to cross the haulage road. or to pass under a power line, the conductor should be protected in a suitable manner to avoid accidental contact. Wherever it is necessary to install live wires on a travelingway, the conductor should be carried on one side of the passage and suitably guarded.

All conductors should be firmly attached to the mine timbers and carefully inspected at regular intervals. Danger signals should be posted at all points where live wires are exposed, and a suitable warning should be posted at the entrance to the mine, cautioning all persons to avoid the danger of contact with live wires in the mine. Where power is used to drive machines at the working face, competent machine runners should be employed who should be instructed to take every precaution against accident to their helpers..

Ques.—Describe the various methods of propping and timbering slopes, gangways and chambers in anthracite mines.

Ans.—Methods of timbering will always depend to a large extent on the nature of the roof, floor and sides of the opening. Under fairly good roof, where the seam has little or no inclination, post timbering is used in chambers and double timbering on the entries. The crossbeams or collars are often hitched into the ribs or supported on short legs toed into the ribs where the coal is hard. Lagging is used over and behind the timbers to give needed support between timber sets where roof and coal are weak. In slopes and in inclined headings and chambers all posts and timber frames are inclined up the pitch a few inches from the normal, depending on the degree of the pitch.

COAL AND COKE NEWS

Harrisburg, Penn.

That the coal miners of the anthracite region are not seeking exemption was demonstrated when the district draft board of Shenandoah attempted to force exemption on a number of mine workers who appeared at the railroad station on July 23 to go to Camp Lee. Two of them knocked down officers who tried to prevent them from boarding the train taking soldiers to camp. Others climbed through car windows, while many left in automobiles for Mahanoy Plane, where they caught the train.

Despite exemption claims filed by the Lehigh Coal and Navigation and other companies in the Schuylkill and Panther Creek valleys, 69 selectives left on July 23, only two less than the full quota. Few of the mine workers will stand for the coal companies' exemption pleas, their claim being that other men can take their places.

At Plymouth, Luzerne County, 21 men on the same date were informed that the coal companies and the Government requested that they be held back as skilled mine employees. The draftees in all these cases had made all preparations to depart and consequently lost a number of days' wages. They have asked that an official slip be issued stating that they came prepared to go to camp, and through no fault of their own were held back by the Government.

The action of draft boards is an aftermath of the meeting held recently at Wilkes-Barre, when Major Conklin, of Provost Marshal Crowder's staff, stated that the boards had authority to place the men in deferred classes on a petition of the coal companies.

Despite the efforts made to keep production rising in the Connellsville regions, the output fell off considerably during the week ended July 20, according to figures made public by the Fuel Administration. Coke production for the week was 347,488 tons, a drop of 808 tons over that of last week's record output, and coal dropped from 168,587 tons last week to 161,140 tons the week just ended.

Car supply for the week was excellent, and idleness on the part of a certain percentage of the men is the only reason that can be assigned for the slump. The Fuel Administration order for a daily check upon the labor slacker is making itself felt, and a noticeable increase is expected in this week's figures.

The scope of the "six-day" order was widened this week when requests were directed by the Fuel Administration to mayors and burgesses of every town in the district asking for coöperation in its enforcement. The authorities are asked either "to run in or run out" any able-bodied men found in their district who have no regular employment.

Although much disappointed with last week's production, Fuel Administration officials take an optimistic viewpoint of the situation and believe that the measures already taken to arraign labor solidly behind the war program will result in appreciable gains in the output within a short time.

Charleston, W. Va.

Production fell off in the Kanawha district during the third week in July, though it was kept above the 200,000-ton mark, the total net tonnage produced being 201,677, as against 205,000 plus for the previous week. Two factors are believed to have contributed to the decrease—loss of power for one day and labor shortage, as mine disability for which lack of power was entirely responsible resulted in the loss of 740 hours—much more than is usually the case. Labor shortage was responsible for 795 hours of lost production. It will also be observed that only 5831 hours were worked, a considerable reduction from the second week in July. It is believed, however, that the total production for July in the Kanawha field will be in excess of that for June.

In the last week there has been a most decided slump in the car supply for the Fairmont field, the number of cars not averaging much over 900 cars a day, which is almost half of the normal requirements. It is said that the slump is approaching an acute stage. It appears that wrecks and derailments, and not the system of distribution, are responsible for conditions in the Fairmont region. Last Tuesday, of 167 mines reporting, 17 were shut down and the number of men idle because of insufficient cars was 1860, resulting in a tonnage loss of 18,345 tons, the cars on hand only amounting to 931, 61 of them being for coke shipments.

That wagon mines, or the so-called "snow-bird mines," are to have recognition was made plain by Dan Howard and other members of the temporary organization committee of five of the Northern West Virginia Coal Operators' Association, who publicly announced that the "snow-birds" were to have proper and fair consideration in the affairs of the new association. The "snow-bird" mine is coming into its own apparently, since it is now recognized that acres of coal which would have otherwise been left untouched have been mined and have helped supply the market. While many of the railroads have put many obstacles in the way of the development of the wagon mines, the Kanawha & Michigan is not one of that class, as it supplies all of its wagon mines with plenty of cars.

Terre Haute, Ind.

Mines in Indiana, for the week ended July 13, hoisted 651,928 tons of coal, according to a statement issued by the Indiana Bituminous Coal Operators' Association. The best previous weeks were in June, when in each of two successive weeks 621,000 tons were mined. Production the week ended July 13 was assisted by the larger number of mines working, the total number being 189. The increase was caused largely by the reopening of several properties on the Southern R. R., which now serves sixteen mines. Car supply was more satisfactory, the total car shortage being only 6.07 per cent. Several of the more important coal roads had a 100 per cent. car supply. The additional tonnage possible with this full car supply was 58,220 tons. The shortage on the Chicago & Eastern Illinois was only 0.96 per cent. and the Chicago, Terre Haute & Southeastern 0.36 per cent. The Pennsylvania had a shortage of 14.45 per cent., the Southern of 20.96, and the Illinois Central of 16.93 per cent. Three large mines at Linton were closed most of the week because the miners refused to work after a train schedule was changed.

PENNSYLVANIA

Anthracite

Hazleton—The Lehigh Valley R.R. has been directed to take the coal of the Coleraine mines to market, this action barring the Philadelphia & Reading R. R. from one of the oldest and richest collieries in the Lehigh field.

Shamokin—The Jones Coal Co., lessees of vast tracts of culm about the Mahanoy Plane, will this week place in operation a model washery and plans to ship from 350 to 600 tons of the smaller sizes of coal to the eastern markets each day. The new operation will be electrically operated.

Sunbury—After a trial which lasted eight weeks, W. C. Moulton, a Scranton coal operator, on July 19 won a verdict against the Philadelphia & Reading Coal and Iron Co. in a suit which involved the ownership of culm banks in Zerbe township, Northumberland County, said to be worth $2,000,000. Moulton alleged he had good title through unseated land-tax sale deeds, while the defendant claimed a clear deed from an original grant to William Penn.

Hazleton—A new ruling on the status of men working about the mines was established on July 22, by the district appeal board of Scranton, in refusing deferred classification to Howard Zullick on industrial grounds. Zullick is employed as a clerk at the Lattimer mines. The appeal board has ruled that clerks and stenographers about the mines are not essential workers and do not come under the recent ruling of the draft officials that mine workers are not to be taken.

The Charles Kehoe & Co. strippings on the Sayre tract of the Lehigh Valley Coal Co., near Mt. Carmel, and the Packer No. 5 operations on Lehigh Valley land at Shenandoah, were sold recently to the Rhoades Construction Co., of Ashland. The purchase covered both equipment and contracts which have many years to run. The Kehoe concern has now disposed of all its holdings outside of the Hazleton basin and will devote its entire attention to the local field.

Pottsville—Philadelphia and New York capitalists are forming a new corporation in this region for the purpose of washing anthracite culm out of the rivers in this vicinity with sluices and flumes, much as is done in gold camps in Alaska. About 100 washeries employing this new method and also the old system of washing culm from dirt banks are to be established, nearly all in this county, with some in Northumberland County. A number of new washeries are to be built along Mahanoy Creek, where there are millions of tons of culm at convenient points.

The greatest war garden in Schuylkill County is being conducted by the Philadelphia & Reading Coal and Iron Co., which has planted a vast tract near the Broad Mountain with corn, wheat, etc. A good crop is in prospect. Many other tracts owned by the company have been leased free of charge to employees. The company is making an effort to have this great mining district show that it not only can furnish this state and many adjacent states with coal, but also supply its own food. A number of years ago the miners of this region raised a considerable portion of their own food products, in gardens adjacent to their homes. An effort is being made to get back to these conditions.

Bituminous

McIntyre—The tipple of the Coal Run Mining Co. for mines Nos. 1 and 3 has been remodeled and enlarged. The railroad company has made additional sidings above the tipple to accommodate increased car facilities.

Somerset—The Orenda Smokeless Coal Co. recently purchased the holdings of the Merchants' Coal Corporation, of Boswell, for $2,000,000. This is the largest deal in this county in some time. All the operations in the Boswell fields are involved.

Uniontown—Four coal miners were killed instantly when they were crushed beneath a fall of slate in the Penn. Coal Co.'s mine at Smithfield on July 19. The dead are George Epley, Arthur Conn, James James and Albert Collins. Officials of the company state that the four men were working together in one section of the mine when the accident occurred. A score of miners worked more than 24 hours before the wreckage was cleared.

West Lebanon—J. C. McGregor, Dr. H. B. Puterbaugh, of Indiana, and Harry E. Clark, of Glen Campbell, have purchased 1200 acres of the Pittsburgh seam of coal between South Bend and Elderton. The consideration was about $40,000. No announcement has been made as to the development of the property.

Washington—Dr. George M. Kelly, of this place, recently sold to the Pittsburgh Coal Co. 92.591 acres in the Pittsburgh or river vein of coal underlying a tract in Canton township for a consideration of $27,777.30, or about $300 an acre. The coal in question fronts on the West Middletown road and adjoins Wolftown, just northwest of Tylerdale.

Indiana—The Manufacturers Coal Co. controlled by an Eastern manufacturing company, is opening new mines on the north side of Yellow Creek, near the present operations of the Meco Coal Co. It is understood that the coal will be used exclusively at the Eastern factories of the company. The mines are located on the Yellow Creek branch of the Pennsylvania Railroad.

Patton—The tipple of the Pennsylvania No. 39 colliery of the Pennsylvania Coal and Coke Corporation, near here, was de-

stroyed by fire last week. Incendiarism is given as the cause, and the company has offered a large reward for the arrest of the persons setting the building on fire. A temporary tipple has been erected and will serve the operation until a large structure can be built.

Berlin—John and Robert Groff have leased 20 acres of the J. O. Stoner 6-ft. vein of coal. They have begun two openings and are into the coal. The coal is under the field north of Stoner's grove, and the drift mouths are a few rods from the end of the railroad track above the Baltimore & Ohio R. R. station. For the present the mines will be operated as wagon loaders, but arrangements may be made later to install a tipple.

Uniontown—C. G. Rockwell, an attorney, of Chicago, this week exercised options taken upon 5000 acres of "back" coal in Whitely and Franklin townships, Greene County, with the initial payment in the $2,000,000 deal to the trustees in bankruptcy of Josiah V. Thompson, former coal baron and banker, now the principal figure in what has been termed the largest bankruptcy case in history. The identity of the purchasers has not been disclosed, but it is likely that the information will be revealed with the proceedings before Referee in Bankruptcy J. G. Carroll. The purchase price in this, the second largest deal in the liquidation of Mr. Thompson's tangled affairs, averages $350 per acre.

WEST VIRGINIA

Page—With a large force of men at work on the completion of a side track from the VirginianRy., the Beaver Fork Coal Co. expects to be able to begin the shipment of coal in the near future.

Princewick—With machinery already on the ground ready to be set up, a conveyor and picking tables will form a part of the new equipment of the Princewick Coal Co. at this place, added in order to secure cleaner coal.

Charleston—Another mine is being opened by the Mead-Pocahontas Coal Co. and the company hopes to begin mining and shipping coal in about 60 days. The general manager of this company is J. C. Sullivan, of Tralee.

Logan—A conveyor system is soon to be installed by the Fire Creek Smokeless Coal Co. at Lego, in Raleigh County, enabling the company to clean its coal with facility. The company also expects to let the contract soon for the construction of a number of houses for miners

Fairmont—Jamison mine No. 7, where a terrible explosion occurred in 1916, has been the scene of activity the major part of the time since the accident. J. M. Wolfe, superintendent for the West Virginia interests of that company, announces that the work of recovery will be completed by Sept. 1.

Worthington—The Worthington Coal Co. has closed down its mine on account of the car supply. But one car was received during the week ended July 13, and it was impossible to hold the miners. Perry D. Burton was the manager, and his employees were taken to another mine operated by him near Monongah.

Welch—Operations on a large scale will be undertaken by the Middle West Coal Co., which has been organized with a capital of $200,000, the seat of operations to be in McDowell County. Those chiefly interested in the organization of the company are Eugene H. Popinsky, Simon Solin, Harry Kline, Nathan Goodman and Harry Bank, all but Bank, who lives at Kimball, being at Welch.

OHIO

Aetnaville—The Koehnline coal mine here has resumed operation after an idleness of more than a year while undergoing extensive repairs. The mine is said to be in the best possible condition, and it is expected to increase the output.

Martins Ferry—The Y. & O. Coal Co. has completed arrangements for opening up a tract of between 10,000 and 15,000 acres of coal land near Connersville, a few miles north of here. The Y. & O. company has extensive holdings in Belmont County, with several mines already in operation.

INDIANA

Brazil—Chicago & Eastern Illinois R. R. officials have denied cars and switching privileges to the W. C. Nash coal mine, near Clay City, on the ground that the operation was not producing enough coal. Mr. Nash is arranging to open a new mine on the Charles Cooprider farm, near Clay City, in a short time.

Terre Haute—Edward Stewart, of Terre Haute, Ind., president of the United Mine Workers' District No. 11, has announced that he has decided not to accept the appointment as state mine inspector, which position was recently offered him by the Indiana Industrial Board. He said that he thought he could do more good in the present national situation by keeping his present place. District No. 11 includes the greater part of Indiana.

Linton—About 675 miners, who have been out on a strike for seven days because of a change in the schedule of a miners' train leaving Linton daily, have returned to work after the Indianapolis and Vincennes Railroad Co. had restored the former schedule. The miners struck because they claimed that the change put an extra hour on them daily in going to and from the mines. Most of the miners worked for the Vandalia Coal Company.

ILLINOIS

Peoria—The failure of the Consumers Coal Co., of this city, to execute a contract given it by the City of Peoria has caused the Council to issue instructions to the city clerk advertising for new bids.

Mt. Vernon—As a result of a strike of employees of the Wabash, Chester & Western R. R., which operates between Mt. Vernon and Chester, four coal mines served by it have been temporarily forced to suspend operations.

Panama—It is said that William McDonald, recording secretary of the Panama coal miners' union, is missing after a warrant had been issued charging him with forgery. It is charged that McDonald, while acting as recording secretary, forged the name of Peter Smith, the treasurer and the president of the local, to orders which he cashed, and thereby secured possession of about $1100 from the funds raised by the miners of Panama to be given to the Red Cross and other war relief work. Officers have been looking for him since about the Fourth of July. Auditors have been placed at work on his books.

McLeansboro—The drillers at Dale, Ill., have reached a depth of over 500 ft., and the prospects are good for a rich vein of coal. If coal of sufficient quality is found, a shaft will be sunk and a mine will be placed in operation just as soon as material and machinery can be installed.

Decatur—No coal has been shipped out of Macon County, but there is strong local demand for the output of the mines. On a recent day 35 teams were noted waiting at the mines. The mines are now running from three to six weeks behind in their orders, all of the coal being used in Decatur and vicinity.

Pana—The Penwell Coal Co. hoisted for the year ended June 30, 1918, a total of 315,870 tons of coal. The car supply for this mine was good, and but little time was lost by the miners. The Pana Coal Co., operating two mines in the same general field, hoisted 352,900 tons of coal, although the hoisting at the North mine was not begun until Jan. 15, 1918. There has been a good demand for coal from both the Penwell mine and the Pana mines.

Carlinville—The Standard Oil Co. has begun sinking the shaft for its No. 3 mine here. The company first purchased the Carlinville mine, which it named No. 1, and then opened No. 2. No. 3 will be completed as soon as possible. A fourth mine, not as large as the others, is also to be opened in October. In Mine No. 2 quantities of quicksand have been encountered which have hindered operation. It is feared that work in this mine will have to be stopped for a time unless a way is quickly found to control the quicksand. A power house costing more than $1,000,000 is under construction at Mine No. 3, which will furnish electricity to all the company's mines.

Harrisburg—The Saline County Coal Co.'s No. 2 mine, known as the "Steel Tipple" mine, has recently been awarded a large flag in honor of the fact that every employee at that shaft is the owner of a Third Liberty Loan bond. R. O. Burke, chairman of Saline War Savings Stamp Committee, made one of the addresses at the raising of the flag and told the miners that if they would make a 100 per cent. record in the purchase of War Savings Stamps that he would personally guarantee them a flag in commemoration of that feat also. The men are making an active canvass of the mine and selling stamps to every employee. In fact, that district known as West Ledford, in which this mine is located, has already sold about $8000 worth of stamps and hopes to make it $10,000. The quota is $9750.

OKLAHOMA

Howe—After being idle for more than 15 years, the 100-oven coke plant built here in 1899 and 1900 by the old Mexican Gulf Coal and Transportation Co. has resumed operations. The property was bought last December by the Howe-McCurtain Coke Co., operators of the coke plant at McCurtain, Okla. Included in the deal was 4000 acres of coal lands. The new operators propose to enlarge the plant as soon as possible and to materially increase its present daily capacity of 125 tons.

TEXAS

Dallas—Headquarters of the Standard Petroleum and Coal Co. has been moved from Mount Pleasant, Texas, to Dallas, and established at 1209 Great Southern Building. B. W. Williams, president of the company, will move to Dallas and take charge of the office. The company owns extensive coal and oil lands in Titus and other east Texas counties, and is preparing to operate on a large scale.

WASHINGTON

Chehalis—The Superior Coal Co. has closed a contract for supplying 200 tons of coal a day to interests in Portland. It has doubled its working force and is laying plans for new development work at once.

Centralia—A fire which broke out in one of the crosscuts of the Mendota Coal and Coke Co. mine has temporarily closed it down.

Foreign News

Victoria, B. C.—In a memorandum issued on July 17 by Charles W. Peterson, deputy fuel controller for Canada, it is announced that Winnipeg is to have 65 per cent. of its normal supply of anthracite coal next winter, while the remainder of the Province of Manitoba other than the City of Winnipeg, and that portion of the Province of Saskatchewan east of approximately the 104th meridian, is to have 50 per cent. of last year's consumption. To the cities of Moose Jaw, Regina and Saskatoon 50 per cent. of last year's consumption is allotted.

Vancouver, B. C.—Shipments of coal from its new coal mines at Cassidy Landing to the bunkers of the Canadian Collieries at Ladysmith have been started by the Granby Mining, Smelting and Power Co., and will continue for the present at the rate of 100 tons a day. This will be increased as the operations at the mine permit. The coal will be stored at the bunkers until the by-products plant at Anyox is ready to receive it, which will be several months, in all probability. Meanwhile work on the company's own bunkers will proceed. Reports from Anyox indicate that work is being rushed on the byproducts plant, the coke ovens now being in course of construction. With its own coal mine and coke plant the company will be assured that it will have available sufficient coke for the smelter and will not suffer from shortage as was the case last year when labor troubles in the Crows Nest district interfered with the output of coal, causing a corresponding depletion of the coke supply at the smelter at Grand Forks.

Personals

H. J. Kennard has resigned as superintendent of the mines of the Coal Run Mining Co. at Kent, Penn.

H. B. Stamper has resigned as superintendent of the Jacksonville Nos. 1 and 2 mines of the Jefferson and Clearfield Coal and Iron Co., at McIntyre, Penn.

Matthew Lewis, formerly of Holsopple, Penn., has taken charge of the United Smokeless Coal Co.'s operations at Humbert, Somerset County, Pennsylvania.

Thomas Hogarth, formerly superintendent of Coal Run Nos. 4 and 5 mines, has been promoted to superintendent of all the mines of the Coal Run Mining Co. Nos. 1 to 7, at Kent, Penn.

A. M. Ogle, of the Fuel Administration, has been spending a couple of weeks in the field. During his absence, C. G. Hall, the district representative for Indiana, has been handling Mr. Ogle's work in Washington.

Spencer Ewing, formerly fuel administrator of McLean County, Illinois, has recently been appointed Director of State Requirements of the State Administration of Illinois. The Bloomington Coal Dealers' Association passed resolutions commending the faithful and impartial services of Mr. Ewing while fuel administrator of McLean County.

A. Yule of the Pioneer Coal and Coke Co. of St. Louis, Mo., is now an assistant to A. W. Calloway in the distribution of smithing coal. He is the first St. Louis coal man to be taken to Washington in connection with the Fuel Administration.

Obituary

John L. Schmidgall, age 47 years, for many years a prominent operator in the Murphysboro (Ill.) field, died in a St. Louis hospital on July 21 after a long illness. He was a graduate of Washington University at St. Louis and for several years was a civil engineer. Later he took charge of his father's extensive affairs, including the Schmidgall mine. The deceased was a member of the State Mining Board some few years ago and was mayor of Murphysboro for the years 1909 and 1910. Besides a widow, he leaves three sons.

Industrial News

Sullivan, W. Va.—The Sullivan Coal and Coke Co. is planning to increase its output from 500,000 to 1,000,000 tons per annum. The plant will be enlarged.

Hazleton, Penn.—The Lehigh Coal and Navigation Co. is planning to enlarge its works for the manufacture of coal briquettes, to provide for increased output.

Hazleton, Penn.—The Lehigh Valley Railroad Co. will increase the capacity of its mixer plant to provide for the blending of small anthracite coal with bituminous for locomotive service.

Stearns, Ky.—The Kentucky & Tennessee R. R. Co., of Stearns, operating in a rich timber and coal belt, where a number of big mines are operating, has increased its capital stock from $25,000 to $625,000.

Houston, Tex.—J. B. Adone, of 436 Westmoreland Boulevard, is planning the development of extensive lignite properties and would like to get in touch with producers of all kinds of mining machinery and equipment.

Jersey City, N. J.—The Central Railroad of New Jersey has awarded a contract to the General Contracting and Engineering Co., 29 Broadway, New York, for the construction of new reinforced-concrete coal pockets at its local terminal.

Oakdale, Ohio—Emmet Riley has leased a tract of 160 acres from the Buckeye Coal & Ry. Co., located on the Zanesville & Western railroad near Glouster. Plans have been made to drive an entry and open a mine to produce about 300 tons daily.

Gooding, Ida.—The Oregon Short Line has been authorized by the Federal Director of Railroads to construct a 12-mile spur track to the Teton coal fields, which are to be fully developed by the Teton Coal Mining Co., of Coeur D'Alene, of which R. C. Talbot is manager.

Greendale, W. Va.—A deal has been closed whereby the Greendale Mining Co., has sold its operating mine at Greendale to the Dollar Coal Co., of Cincinnati, which will make improvements and extensions and operate it in the future. The present capacity is about 300 tons daily.

Sassafras, Ky.—The Montgomery Creek Coal Co., recently incorporated with a capital of $100,000, has perfected its organization and is said to be planning for the early development of about 1000 acres of coal properties in this district held under lease. J. W. Reedy, of Lothair, is president.

Seattle—The Seattle School Board is considering an offer of the Pacific Coast Coal Co. to install coal burners in the schools here for burning powdered coal for heating purposes. All schools which were until the first of the year equipped to burn oil have been changed to coal burners.

Newark, N. J.—Until 1.30 p.m., Aug. 7, the Board of Freeholders will receive bids for the construction of reinforced-concrete coal pockets, including the installation of coal conveying machinery and equipment, at the Essex County Hospital, Overbrook. Runyan & Cary, 845 Broad Street, consulting engineers.

Louisa, Ky.—It is reported that the Louisa, Fort Gay & Torchlight Coal & Development Co., capital $1,000,000, organized by C. E. Stafford president, and others, plans the development of coal lands, the operating of ten collieries, construction of ten miles of railroad, and also the building of a central power plant on Lick Creek.

Charleston, W. Va.—Tracts of coal lands in Clay and Nicholas Counties will be developed by the Gauley Coal Co., which has been chartered with a capital stock of $100,000. Those principally interested in this company are Mat Levy, M. E. Moore, Louis Levenson, Elmer G. Biddison, Lemual A. Maxman and Louis Levy, all of Charleston.

Mortonville, Ohio—The Buckeye Coal & Ry. Co. has leased to William M. McCracken of Lancaster, O., a tract of 160 acres of No. 7 coal near Mortonville, which he will open by driving an entry. Electrical power will be secured from the Mortonville power plant of the Buckeye company. It is planned to equip a mine to produce 350 tons daily.

Charleston, W. Va.—The Marmet-Oliver Coal Co. will operate mines in Kanawha County, and with that end in view has secured a charter under which a capital stock of $50,000 is authorized. Those principally interested in the new company are Edwin Marmet, Thomas Oliver, V. L. Black, John Wehrle and S. P. Richmond, all of Charleston.

Piedmont, W. Va.—Holdings of the Fredlock Coal Co., of Piedmont, in Preston County, will be developed by that company, which has been chartered with a capital stock of $10,000, the incorporators being Frederick W. Fredlock, Jessie R. Fredlock, Robert McV. Drane, of Piedmont, Louis Adams and C. C. Culbertson, of Westernport, Md.

Charleston, W. Va.—Coal in the No. 2 gas seam on Campbell's Creek, in Kanawha County, will be mined by the Dana Coal Co., which has been organized and chartered by H. A. Jepson, of the American Rolling Mill Co., Marting, W. Va., with an authorized capital stock of $100,000. Offices will be maintained in the Union Building, Charleston.

Charleston, W. Va.—An acreage of coal in Elk District, Kanawha County, will be developed by the Liberty Coal Mining Co., recently incorporated with a capital of $10,000, the incorporators being B. M. Smith, J. A. Thomas, J. V. Sullivan, W. E. Whiteman and C. A. Wood. It is stated by one of the incorporators that work will be begun in about two weeks.

Oakland, Md.—The Freeport Coal Mining Co., a corporation engaged in mining near Corinth, W. Va., will increase its capital stock from $25,000 to $100,000, and has let the contract for extensive improvements and construction work on its property. The sole owners are Messrs. Campbell and Hoffa, of Piedmont; F. A. Thayer and Herman Creutzburg, of Oakland; and George Warnick, of Bloomington.

Clarksburg, W. Va.—Another mining operation in Harrison County will be established by the Diamond Fuel Co., this company owning a tract of coal in Simpson District. With a view to producing coal on a large scale, the company has been chartered with a $50,000 authorized capital stock, the incorporators being Paul E. Reutter, Wayne B. Hornor, Chas. B. Johnson and Carl Hornor.

Uniontown, Penn.—An order has been issued in United States District Court directing the immediate sale of 3000 shares of the Liberty Coal Co. and 7000 shares of the Wetzel Coal and Coke Co., both West Virginia corporations, to liquidate J. V. Thompson's indebtedness to the First National Bank. The indebtedness approximates $800,000, while the two blocks of stock have a reputed value of $1,700,000.

Decatur, Ill.—It is estimated that Decatur industries will store this summer at least 100,000 tons of coal. The largest consumer is the Wabash Railway Co., which is placing between 30,000 and 35,000 tons of coal in storage for next winter. The Decatur Railway and Light Co. will store 5000 tons of coal, and there are a score more of industries which will lay in from 500 to 15,000 tons each.

Sebree, Ky.—N. O. Tyler and J. M. Anderson, of Birmingham, Ala., representing the New Sebree Mining Co., recently incorporated with a capital of $100,000 with headquarters at Hopkinsville, were recently in Sebree looking over the old Sebree coal mine, of the Sebree Mining Co., which has been purchased. It was stated that improvements would be made at once, and the mine would be shipping coal again before cold weather.

Springfield, Ill.—State Fuel Administrator Williams of Illinois has announced that the allotment of anthracite to Illinois shall be divided on an equal percentage basis among the thirteen northeastern counties of the state — Stephenson, Winnebago, Boone, McHenry, Lake, Ogle, De Kalb, Kane, DuPage, Lee, Kenall, Will and Cook. The distribution will be on the basis of about 80 per cent. of the consumption in 1916 and 1917.

Hazard, Ky.—Coal operators of Perry County feel that they did good work when during the fiscal year ending June 30, 1918 they showed 1,618,353 tons of coal mined as compared with 998,000 tons during the preceding year. This is a healthy increase, but the operators claim they will surpass it this season if the labor supply holds up anywhere near requirements. A number of good mines, well equipped, are operating in the section, and these operations are keeping up with modern methods.

Alton, Ill.—Utilization of the Alton river terminal for the landing of coal on barges is contemplated in the plans of M. V. Sanders, Federal Inland Waterways Manager, who has charge of the establishment of barge service on the river. The terminal, which was equipped with hoisting apparatus, will enable the loading of great quantities of coal direct from cars to barges to be transported up and down the Mississippi. A. W. Mackey, of St. Louis, Sanders' assistant, will inspect and determine to what extent it can be used.

Charleston—D. H. Morton and associates of Burnwell, Raleigh County, have organized the American Eagle Colliery Co., and plan to expend $300,000 in the construction of a plant in Raleigh County, the mine to be a drift mine. It is estimated that the capacity of the new plant will be 300,000 tons a year. Work on the new plant will start shortly it is said. The Colliery company has been incorporated with a capital of $600,000, the incorporators being G. S. Couch, V. L. Black, L. G. Summerfield, Angus W. McDonald and S. L. Boriarsky, of Charleston. The superintendent of the new plant is to be Holmes Morton, who is located at Burnwell.

Indianapolis, Ind.—It is probable that fourth vein coal, the best grade of coal taken from Indiana mines, will be taken from the market, except for certain industrial plants engaged in work essential to the prosecution of the war and which can use no other grade of coal. A prediction to this effect was made by R. L. Flood, of the Quartermaster's Department of the United States Army, who was assigned to Indiana to supervise the establishment of preference lists for industrial plants engaged in war work and to work in coöperation with the state fuel administrator. Fourth vein coal is scarce, and this has caused the Federal Fuel Administration to desire to husband it closely.

Chicago, Ill.—The Chicago & Alton R. R., which is handling an immense amount of coal into Chicago for both city consumption and for delivery northward, has lodged a protest with the Cook County fuel administrator saying that receivers of carlots of coal have failed to unload consignments promptly. The Alton officials are keeping a sharp lookout for receivers who fail to unload their coal as soon as they should, and a systematic check will be kept on the failure of these men to send cars back. The Alton has received five new locomotives from the Baldwin locomotive works, and with the new engines assigned it by the Government will be able to move a vast tonnage of coal as well as of other commodities.

Columbus, Ohio—The State Public Utilities Commission has secured from the Supreme Court a writ of mandamus to compel the Morgan Run Coal Co., operating a three-mile railroad in Coshocton County, to furnish service to other coal mines on the line than that owned by the company. The proceedings resulted from complaints by other operators with mines on the road that service was refused them by the Morgan Run Coal Co., the latter defending on the ground that it was not a common carrier. The Commission, after a hearing, held that the road was a common and not a private carrier, and ordered the company to furnish car and transportation service to other mines on the line, but the company refused.

Fort Wayne, Ind.—Coal dealers of this city, when asked by their county fuel administrator to lay in large supplies of coal, appealed to their local banks for credit with which to purchase the coal. The banks asked for a statement of how much money was due the coal companies from delinquent customers. A list was prepared, taken from the books of the dealers, and it was found that there were 4000 consumers in Fort Wayne who owed the dealers $140,000. The fuel administrator says that he will permit no dealer selling to any delinquent customer of any other dealer, and that all those in arrears will be denied coal. The delinquents who pay their old bills can secure coal from any dealer. The administrator is preparing to store 25,000 tons of coal for emergency purposes next winter.

MARKET DEPARTMENT

Weekly Review

Market Generally Optimistic—Production Heavy But Not At Record—Stocks Accumulating in Certain Instances—Lake Movement Heavy

THE week's coal production while not establishing any new records has been heavy, closely approximating the best week the country ever experienced. Car supply has also been good, in some few cases equaling or even exceeding requirements. The accumulation of stocks is gradual and most pronounced in the case of the domestic and small industrial consumer. Railroad stocks are increasing with slowness as are also those of big industrial consumers.

The householders on the other hand are accumulating their winter's supplies and it is probable that by cold weather there will be but few that ordered their coal last spring that will not have a supply sufficient to carry well into the winter.

Recent fear of congestion at various points, particularly in New England, has arisen more from a shortage of labor wherewith to unload cars than from lack of motive power. A greater variety of cars than formerly are also being employed in the coal trade and the use of other than dump bottom cars is occasioning considerable inconvenience. No one thinks of entering complaint, however, as all dealers and consumers are glad to get the coal irrespective of the car it is shipped in.

The Lake trade is heavy and it is probable that there will be no greater shortage in the Northwest during the coming winter than there was during the past.

In the Middle West some coal has been sold at less than the Government price. This is perhaps significant of the position that coal occupies in the market. Since the Government prices went into effect it has been seldom indeed that coal has been sold in the open market for less than the Government figures.

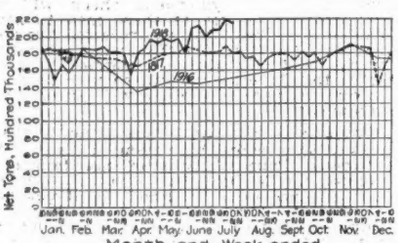
The car supply, taking the country as a whole, appears to be somewhat better than in some past weeks. In some localities in the East the car supply has been fully equal to the demand, while in Illinois some mines have only been able to work about three days per week. Much complaint is heard concerning this car distribution.

Because of railroad and navy demands for gas coal some illuminating gas companies are experiencing difficulty in securing supplies. Coal has been shipped all the way from western West Virginia to New England for this purpose. It is believed, however, that any great quantity of this coal will not be shipped such a distance for this purpose.

The demand for coal is everywhere brisk with supply just about equaling the demand. Production is heavy, car supply in general fair and individuals and small industrial consumers are beginning to get small stocks ahead.

COAL PRODUCTION

Production of bituminous coal during the week of July 20, while not equivalent to the record week of July 13, was higher than any previous week. The output during the week ended July 20 (including lignite and coal made into coke) is estimated at 12,950,000 net tons as against 13,273,000 net



tons during the week preceding, or a decrease of 2.4 per cent. and as against 11,230,000 during the corresponding week of 1917, or an increase of 15.3 per cent. The average production per working day during the week of July 20 is estimated at 2,159,000 net tons as against 2,212,000 net tons during the week previous and 1,872,000 net tons during the week of July 20, 1917.

Shipments during the week of July 20 decreased slightly from all districts with exception of Iowa, Texas and the Southwest States, the increase in this district amounting to 1.2 per cent. over the week of July 13. Carriers' reports show that shipments from Central Pennsylvania decreased 2.4 per cent., from Ohio 1.5 per cent., from Southwest Virginia 5.6 per cent. and from Illinois, Indiana and Western Kentucky 2.3 per cent.

CARLOADS OF COAL ORIGINATING ON PRINCIPAL COAL-CARRYING ROADS

	Week Ended: June 29	July 6	July 13	July 20
Bituminous shipments, 123 roads	219,625	180,090	235,291*	229,545†
Anthracite shipments, 9 roads	41,641	31,493	42,419*	40,664†

* Revised from last report. † Subject to revision.

Anthracite shipments during the week ended July 20, declined 1755 carloads or 4.2 per cent, compared with the week preceding, the total movements amounting to 40,664 carloads.

Beehive Coke—The production of beehive coke in the United States during the week ended July 20 is estimated at 668,188 net tons as against 680,285 net tons during the week preceding, or a decrease of 1.8 per cent. The average production per working day during the week of the 20th is estimated at 111,000 net tons as compared with 113,000 net tons during the week preceding.

Byproduct Coke—Working conditions in the byproduct coke industry improved considerably during the week ended July 20. The plants of the country produced 517,671 net tons of coke and were operated at 91.2 per cent. of their present capacity as against 89.8 per cent. during the week of July 13. Repairs to plants during the week caused losses attributed thereto to decrease from 5.4 per cent. to 4.8 per cent. and other causes which entailed a loss of 1.9 per cent. of present capacity during the week of July 13 decreased to 1.1 per cent.

BUSINESS OPINIONS

Bradstreet's—The line of cleavage between war industries and what are termed non-essentials is more marked, the first named becoming more active, while the latter, feeling increased difficulty in getting adequate supplies of materials, labor and coal, faces a serious situation. The week has seen further large drafts made upon man power for the military service, a marked shifting of existing forces, and increased participation of women in industry being foreshadowed. Further heavy orders for and enlargements of munition plants, increased speed in steel production and in shipbuilding, and heavily augmented outputs of clothing and other supplies for the rapidly growing armies, are other features of the week.

American Wool and Cotton Reporter—The wool situation has settled down to a point where manufacturers can be relatively certain as to what their supply of raw material will be. It is quite likely to be the supply of raw material which they have on hand, plus whatever amount of substitutes their ability will permit them to handle. It is felt that as long as the price of wool is regulated, manufacturers will be safe; but should any condition develop whereby the costs of raw material advance, the manufacturers would be placed in a difficult position. In cotton goods it will require strict regulation, much more strict than has been noted up to the present, if a regular price scheme is to be established and if that stability which is so desirable is to be imparted to the market.

The Iron Age—In its third warning to consumers of steel within three months the War Industries Board puts the needs of the second half of the year for war and essential industries at 20,000,000 tons of finished steel products, or 3,500,000 tons more than the expected output. A sharp challenge of the 20,000,000-ton estimate came from automobile interests, accompanied by a call for a definite assurance as to steel supply, even on a reduced scale. No assurance has been given, nor can it be given, the most certain thing in the prospect being that the use of steel for war purposes will increase, while production is less likely to increase.

Marshall Field & Co.—Current wholesale distribution of dry goods is in excess of the large shipments of the corresponding week in 1917. Road sales are larger than those for the same period a year ago. Customers have been in to market in greater numbers. Collections are very satisfactory.

The Dry Goods Economist—Interest in textiles during the week has been devoted chiefly to the price-fixing of cottons, accomplished and prospective, the possibility of getting additional supplies of wool, and measures which will have to be adopted if it becomes necessary to depend entirely on existing stocks of dress goods and of other woolen fabrics for the trade's needs during the coming fall and winter. Emphasis was given to discussions of the cotton and woolen goods situation by the announcement of Secretary of War Baker as to the need for an army of 5,000,000 men before the end of this year. Secretary Baker supplemented this assertion with the statement that at least 2,000,000 men must be in Europe before Dec. 31.

Atlantic Seaboard

BOSTON

Receipts of bituminous now in good volume. Reserve stocks creeping up, especially with smaller users. Railroads accumulate stocks slowly, but are far behind last year's reserve. All-rail shipments continue to show steady increase, although figures are about the same as for March and April. No sign yet of car congestion on New England roads. Number of gas plants where usual source of supply is Pittsburgh or Connellsville, find no provision made in fuel "budget." Hampton Roads situation better, but detention is certain if fuel authorities sag off from recent orders turning coal to Tidewater. Anthracite receipts are fair all-rail but still slow by water. Agitation over municipal buying.

Bituminous—Ample car-supply, record production, and perceptible increases in stocks on hand have all had their favorable effect on New England buyers. Distinctly there is a much better feeling in the trade over the status of bituminous than was the case a month ago. It has even had its effect upon the purchase of anthracite screenings. There is simply a less anxious disposition among buyers who for nearly two years now have been under constant strain to get coal forward. This is probably as near as we shall come to what in normal years would be midsummer dullness.

Larger stocks are especially noted among the smaller steam-users. The shortage of labor everywhere is a factor and distributors are careful about sending cars in large number to certain plants because of the delays that usually follow. The large consumers are not well stocked in proportion. In fact, some of the largest utilities have been unable thus far to accumulate coal in sufficient volume to give them even a safe margin of supply. The corps of scouts organized by the New England Wholesale Coal Association is doing effective work. There is a natural tendency of consumers to exaggerate the tonnage used and for that reason the use of experienced coal men in policing distribution is of special value.

Effective July 22 all wagon-loaded coal in box cars in the central Pennsylvania districts was taken over by the Fuel Administration, the coal to be sent to the scales for disposition by the district representative. It is assumed that this will mean a considerably increased movement to this territory. Wagon coal forwarded on direct requisition through the Fuel Administration is to be invoiced to Mr. Storrow when tagged for New England points. New England consumers are ready to take whatever tonnage can come forward in box cars and the effort is made to spread them over a wide area in order to prevent detention at destination.

As yet there are no indications of congestion at any of the New England gateways. The roads at this end are handling promptly all the coal traffic turned over to them and so long as general freight remains at its present level at least 200 cars more per day could be taken care of. A week ago there was some anxiety lest the New Haven R. R. show signs of extra detention at certain stations but it was recognized that these local situations were due to scarcity of help rather than to lack of motive power. The worry therefore was over possible delay in returning empties and a temporary car shortage that might follow. Part of the car accumulation was due to wholesale diversions of coal originally marked for South Amboy and since this was done in blocks of 400 to 500 cars there were bound to be humps here and there.

Notwithstanding all the representations that have been made to Washington over the heavy tonnage of railroad fuel being drawn from gas coal districts, particularly from grades low in ash and sulphur, railroad contracts are receiving 90 @ 100 per cent. performance, while illuminating gas requirements in New England are in arrears on shipments. It has been pointed out repeatedly that the use of high grade gas coal in locomotives is wasteful and that the railroads might as well begin now to use medium grades on fast trains.

The outlook for illuminating plants gets complicated when usual sources of supply are absolutely shut off and the gas plants are obliged to look for consideration at the hands of new shippers in districts that are already overburdened with other requisitions. For the moment an increased tonnage of Kanawha splint and other West Virginia high volatiles is being received via Hampton Roads, but it is hard to see how an adequate tonnage can be relied upon. Lately there has even been a tendency to arrange for gas coal in the Kentucky districts, sample shipments having been forwarded by rail, but doubtless there will be a regulation to prevent cars being used for so long a haul.

The volume of coal eastbound to Hampton Roads continues large and despatch at the piers has correspondingly improved. At this writing there are only about 30 bottoms waiting where a fortnight ago there were 70, and daily dumpings are being held at the 60,000 ton mark. Coastwise steamers have suffered some detention but the demurrage paid was not so serious as feared, two days at 25c. per ton having been the average for both loading and discharging. Renewal of U-boat activities off the coast has again caused slower movement. One of the results is a general order through the Emergency Fleet Corporation to camouflage steamers in the coal trade. The number of ships in repair yards is away above normal, although at this juncture with the number of new vessels entering the service a little extra time spent on camouflage will not be any great handicap.

Anthracite—For 25 days in July the daily receipts of domestic sizes at the five gateways averaged 644 cars. The daily average for steam sizes was 180 cars or 23 per cent. of the total anthracite. The latter is smaller in percentage than heretofore but this is due to increased movement of domestic sizes. While these figures indicate fair shipments all-rail, the mark is considerably below what was reached in June. August will therefore have to show a material increase if New England is to receive its full quota. Water shipments are still seriously affected by the lack of towing power and the cautious operations of what barges and tugs remain in service. Receipts from New York ports are also affected by the disinclination of Long Island Sound barge owners to send their craft this side of the Cape because of the delay in moving bottoms from the canal to Boston points.

The desire of Boston municipal authorities to take over the retail distribution of anthracite has had a prominent place in the newspapers the past week. Mostly this publicity disclosed a lack of information on what seems to be a peculiarly difficult business to understand. The mere advance of 25 per cent. in railroad tolls effective June 25 seems to have meant nothing at all to the city fathers and they showed great surprise and even resentment over an advance in retail prices to cover the extra cost.

NEW YORK

Anthracite moving easier but supplies are lacking. New state fuel administrator pleases the trade. Dumpings at the local tidewater piers fall off. Anthracite committee discontinues shipments to various communities. Bituminous conditions improve. Car supply better and railroads move coal rapidly. Change made in bunker pools. Labor shows dissatisfaction.

Anthracite—There has been a noticeable change in the situation. Coal is moving easier, but there is no more surplus on hand owing to the continued heavy demand.

The trade here feels easier now that the office of state fuel administrator has been filled by the appointment of D. W. Cooke, who has been identified with the Erie R. R. as vice president in charge of traffic, and who is thoroughly acquainted with the coal industry. It is expected that Mr. Cooke will see to it that New York will receive its just quota of fuel and that its receipt will soon wipe out the feeling that New York will face a famine next winter. Mr. Cooke promptly entered into the solving of the problems before him and has already had conferences with some of the county administrators of the state. Following Mr. Cooke's appointment there was a strong rumor that C. E. Robertson, who was deputy administrator under Albert H. Wiggin, and since the latter's resignation acted as state administrator, had sent his resignation to Dr. Garfield. When it was announced that it was the intention of the Washington authorities to name two administrators for New York State it was stated that Mr. Robertson was slated to look after New York City and Long Island, which was to comprise one district. Mr. Robertson was not in favor of dividing the state, and the division has not been made.

Although production reports indicate that the mines are operating at capacity with existing labor conditions, the local situation is described as being as bad as at any time. Domestic coals are not to be had in greater quantities than have existed for some time and this includes pea and buckwheat No. 1. Consumers in some instances are using rice in place of buckwheat and some have resorted to burning barley in place of the larger of the steam sizes.

In view of the optimistic reports from the mining regions as to production, the trade here is inquiring as to the destination of the shipments. No gain is reported in receipts here and the dumpings at the local tidewater docks for the week ended July 26 show a falling off of 321 cars, as compared with the week previous, when 7375 cars were discharged. For the week ended July 26 7054 cars were dumped. If reports are authentic this market is to be accorded increased shipments beginning early in August.

There is plenty of barley to be had and most dealers say they have more of this size on hand than they have had in many months. Many of them are looking for bituminous so that they can dispose of both coals together.

Conditions in the mining fields are unchanged. Labor continues to leave the mines for other industries where higher wages prevail, but the authorities have taken steps to prevent this and to put mine workers in deferred classes. In this way it is hoped to keep production up to the top notch. The mine workers are watching with interest the efforts of their leaders to reopen the wage agreement and appear to be confident that they will receive increased wages. They are being urged by their leaders to do everything possible to keep up a record production, meetings being held in the three districts for that purpose.

The anthracite committee of the fuel administration has issued orders discontinuing shipments of domestic coals, including pea, into 51 communities in Vermont and to 89 counties in Illinois. The committee also placed an embargo on all shipments of pea and larger to all points in Ohio south of the main line of the Erie R. R. running across the state from Orange to Wren.

Current quotations, per gross tons, f.o.b., tidewater, at the lower ports, are as follows:

	Circular	Individual		Circular	Individua
Broken	$6.75	$7.50	Pea	$5.20	$5.95
Egg	6.35	7.10	Buck	5.10	5.90
Stove	6.60	7.35	Rice	4.65	5.10
Chestnut	6.70	7.45	Barley	4.15	4.30
			Boiler	4.60	

Quotations for domestic coals at the upper ports are generally 5c. higher on account of the difference in freight rates. Prices for buckwheat, rice, barley and boiler are not fixed by the Government.

Bituminous—With conditions indicating a slight improvement there is a feeling that with the mines keeping up to their production of the past two weeks the expected shortage of bituminous next winter might be averted. The heavy demands do not, however, permit of much storing in this vicinity. Reports from other near-by sections indicate that manufacturers are more fortunate and that some of them have good sized storage piles.

Further changes have been announced by the Tidewater Coal Exchange in the composition of the pools containing coals suitable for bunkering of transatlantic steamers. All coals consigned to Pool No. 9, when intended for use in bunkers, are to be sent to Pool No. 71, a new pool, and the coals formerly consigned to Pool No. 10 that have been allowed to be used for bunkering for transatlantic steamers are to be sent to Pool No. 72, also a new pool. All other coals sent to Pool No. 9 are to be used for commercial purposes. No coals are to be mixed, that is, coals sent to Pools Nos. 71 and 72 cannot be loaded into the same cargo. Under the new orders coals consigned to Pools Nos. 1, 71 and 72 can be used for transatlantic bunkers, while those sent to Pools Nos. 1, 4, 10, 71 and 72 are permissible for coastwise bunkers.

It is expected that these changes in bunkering coals will increase the quantity of commercial coals in this market. Consumers are said to be willing to pay the additional cost allowed producers of bunker coals if they could obtain some of them for commercial purposes, so urgent is the demand for fuel.

There is a better feeling among operators as to the outlook. Car supply on the Pennsylvania and New York Central is said to be all that can be expected at this time, but labor is dissatisfied. The railroads are doing much better in the movement of coal. Shipments from central Pennsylvania to New Jersey points are coming through in four days, whereas the average at the corresponding time last year was from 3 to 5 days longer.

The demand for railroad fuel has increased rapidly and some of the roads that heretofore have used anthracite on their passenger locomotives are now using a

mixture of bituminous and anthracite steam sizes.

The public has been warned that violators of the new "lightless" night rules will be prosecuted.

There was a falling off in dumpings at the local tidewater docks for the seven days July 20 to 26, inclusive, 6922 cars having been dumped, as against 7130 the previous week.

Current quotations, based on Government prices at the mines, net ton, f.o.b. tidewater, at the lower ports, are as follows:

	Mine Gross	F. o. b. N. Y. Gross
Central Pennsylvania:		
Mine-run, prepared or slack	$3.30	$5.45
Upper Potomac, Cumberland, and Piedmont Fields:		
Run-of-mine	3.08	5.23
Prepared	3.36	5.51
Slack	2.80	4.95

Quotations at the upper ports are 5 c. higher.

PHILADELPHIA

Anthracite demand continues despite hot weather. Slight improvement in receipts. Dealers doubtful as to future; authorities optimistic. Miners' unrest affects trade. State tax refund. Additional carrying charge. Little canal tonnage now expected. Exports supervised. Lightless nights in effect. Bituminous continues in good volume. Car supply in excess of needs at times. Government ownership doubted.

Anthracite—Despite a week of intensely hot weather there was no diminution in the demand of the public for coal. As many people feel summer is slipping away without coal in their cellars their anxiety increases. Of course the most of these are people who never heretofore ordered their coal in the summer, but now that they have been induced to do so they fear if the coal is not delivered before Sept. 1 they are liable to suffer accordingly. As to receipts there is just the barest possibility that on the average shipments have been slightly better than the previous week, but even at that not up to the quota for the city.

It is generally known among the dealers that there is a slight decrease in production of domestic sizes at the mines from week to week as compared with last year and they are probably more pessimistic than the consumers. However, we feel that the fuel authorities have begun to give this fact the fullest recognition now, as the instructions to cut off shipments to certain states contiguous to soft coal mines increase.

The unrest among the miners is being felt among the interests here, from producer to consumer. The operators here seem more anxious to increase production than anything else and now have a plan whereby the patriotism of the men can be further stirred to increased activity in coal production. The plan is to engage soldiers who have served in foreign armies, such as Poles, Slavs and Italians to go into the region and urge upon the men the importance of their staying in the mines and producing coal and that by so doing they will be doing a work equal to the soldier in the field. This plan has gained much impetus since the men are refusing exemption by the draft boards and getting into the war by enlisting.

To the surprise of every one in the trade one of the large companies has sent notices to its customers asking them to make up bills for tax collected under the last state tax law, which was declared invalid by the courts over a year ago. The dealers all along have known that they were entitled to this tax, but had come to the conclusion that the companies were too busy to work up the refund under present conditions. Since the lead has been taken it is quite likely now that all the other companies will follow.

Due to the many complaints entered by dealers because of the low charge allowed for carrying coal into cellars when it cannot be chuted in, the administration has granted an increase of 25c. to 40c. a ton. This is hardly satisfactory, however, and a number of dealers are reported as refusing to take orders where there is an extra carry. Some of the dealers had adopted the practice of dumping the coal on the sidewalk, but the fuel authorities refused to place their official sanction on this. Some consumers are making arrangements to do their own carrying. The fuel authorities have also had complaints from citizens who claim that dealers will not take their orders at all, claiming they have already more orders than they can take care of.

With the summer almost half gone it is seen that little coal will reach the city via canals, although great promises had been held out earlier in the summer. The matter has not been abandoned by any means, for dredging of the Schuylkill canal continues and it is expected that some shipments will be made via that route. The Lehigh canal is in operation, but whereas 40 crews were operating last year, only 26 are working this summer and no shipments are made south of Bristol, Penn. Dealers here with water yards are being supplied via barges from Port Richmond piers.

The lightless night order has gone into effect without friction, although in some sections a few violations were discovered, probably due to a misunderstanding of the edict. It is believed that a considerable saving of coal will be effected by this curtailment of four nights of the week beginning with Monday.

The steam trade continues as active as in midwinter. No coal of any size, except culm, is offered, and this is so well taken by outside markets that little effort is being made to seek local business. It is also understood that shipments of this coal have recommenced to the states which had been cut off by the order prohibiting shipments of any kind of anthracite. The authorities were shown that shipments of culm to these states could not affect the general situation and thus authorized the resumption of culm sales.

The prices per gross ton f.o.b. cars at mines for line shipment and f.o.b. Port Richmond for tide are as follows:

	Line	Tide		Line	Tide
Broken	$4.90	$6.25	Buckwheat	$3.40	$4.45
Egg	4.50	5.85	Rice	2.90	3.80
Stove	4.75	6.10	Boiler	2.70	3.70
Nut	4.85	6.20	Barley	2.40	3.30
Pea	3.45	4.70	Culm	1.25	2.15

Bituminous—Good shipments of bituminous continue to arrive and it is the feeling that this condition will prevail right along now, at least until winter. The matter of car supply seems to have been solved and it is not uncommon these days for many mines to receive more cars than can be loaded. This is explained by the fact that when calls for cars are placed by mines they ask for the full rating of their plants, but there is no way of telling how many men will turn out on the succeeding day. This is a condition that is becoming general in the bituminous region and led to a report being issued from Washington stating that the mines as a whole have recently received more cars than they can use. The cars could be used if the men were available to produce the coal.

Quite a little trouble has been occasioned for the bituminous distribution committee by the shutting off of anthracite to 31 counties in the state. Retail dealers in those counties are calling upon this committee to procure them a source of supply of bituminous coal to take the place of the former anthracite. Before directing shipments it is necessary for the committee to have some assurance as to the credit standing of the applicants, many of whom only need a few cars of coal, and it is taking considerable time and effort to effect this.

Little credence is given locally to the intimation in some quarters that the Government is liable to assume control of the mines this winter if there should be a failure to produce sufficient coal to meet the needs of the country. As a matter of fact it is hard to be seen how the Government could have a closer control on the business than it has now.

BALTIMORE

This section hard hit by plan to send all available fuel to more distant points. Small reserves being rapidly exhausted. Hard coal, after brief spurt, continues record much behind expected schedule of receipts here.

Bituminous—Under the general Government plan of sending all coal possible to the Northwest and to New England in this mid-summer period, the Baltimore fuel district is hard hit. A. W. Calloway, Federal fuel director, who was in this city during the week, explained that it had been decided to cut to a minimum the deliveries in territories contiguous to mining sections in order that distant consuming territories, where sufficient fuel is absolutely necessary for war industries, be supplied before any chance of wintry weather cutoff comes. This would seem to mean that consumers here of soft coal may have to scrape along from hand to mouth until near Thanksgiving and rely throughout the winter upon heavier deliveries to keep them going at a time when deliveries farther north would be difficult if not impossible. The office of Maryland Fuel Administrator Meyer was the scene of much urging for fuel the past week, and this condition continues, despite the fact that many consumers have not awakened to the tightness of the situation. It is only those who have been caught without coal by the cutting off or curtailment of their direct deliveries, or those who are now forced to use part of reserve supplies at a time when they are usually stocking up, who make up the group of more urgent claimants.

Anthracite—Hard coal men here report another slump in receipts after a brief spurt in the first ten-day period of July. The general condition is shown by the fact that the total receipts for June fell not only behind the 10 per cent. increase in allotment set for Maryland, but behind the receipts for June of 1917. Last month the total received was 58,777 tons, against 64,751 tons in June, 1917. In addition war industries here used probably 4500 tons more this June of hard coal than in June of last year. On July 1 the total reserve of hard coal in Baltimore, as reported by dealers, was 23,000 tons; and the same dealers reported 264,000 tons of orders undelivered on their books, with prospects of a total of 300,000 tons undelivered before Aug. 1. At the rate of present receipts it would take until the end of January to deliver the coal already ordered. Each new draft is leaving the retail dealers with less working force, and even if the coal should come in heavily in September and October the majority of hard-coal men here fail to figure out how they can deliver it.

Lake Markets

PITTSBURGH

Heavy Lake shipments. Production substantially at record rate. Much coal by river and truck.

At latest reports Lake shipments from the Pittsburgh district were running at the rate of 1,400,000 tons for the month, but the month as a whole is expected to make a better showing than this. The original quota for the month was 1,300,000 tons, but on account of the extra demands upon West Virginia and Kentucky from the navy the Pittsburgh district has been required to exceed its quota as much as possible.

Production of coal in the district is substantially at record rate. Car supplies are not equal to requirements, but are more satisfactory than at any time recently. Labor performance has improved somewhat and the efforts of the various Governmental agencies are being continued to produce as nearly 100 per cent. efficiency as possible.

Nearby consumers of coal are receiving substantially as much fuel as required for current operations. No rail coal is being stocked, as the local distributor's orders are emphatic on that point. River coal shipments are heavy and a considerable proportion of this coal is being stocked, by the limited number of consumers who can take river delivery. A project has just been broached to lengthen the locks on the Monongahela river, as with the increasing traffic there is hardly enough capacity, while time is lost breaking tows. A great deal of coal continues to be trucked to manufacturing plants. Buyers of such fuel are making the best of a bad bargain, as the cost of the coal is materially increased.

The market remains quotable at the set limits: Slack, $2.10; mine run, $2.35; screened, $2.60 per net ton at mine, Pittsburgh district, brokers being allowed to charge customers up to 15c. commission in addition.

BUFFALO

Large demand for anthracite. Better shipments by lake. Bituminous moving slowly. Jobbers not hopeful, but will keep up business as best they can.

Bituminous—The trade does not change much. A ray of hope is found in the official report of record production, but a jobber who claims to be posted says that it cannot last. He also takes the pessimistic side of the case by predicting a political outcome of the public control of the trade. This section has about forgotten politics in such matters. It is well to look on the other side of business these days. As a rule this is done. If a jobber can get no coal he watches his chance and tries again. Many reports of the alleged actions of the Government with regard to the jobber are going about, but they almost always turn out to be conjectures.

Bituminous prices are as follows to this market: Thin-vein Allegheny Valley, all sizes, $4.65; Pittsburgh lump, $4.45; Pittsburgh mine-run and slack, $4.20; cannel, $6.20; smithing, $5.85, all per net ton, f.o.b. Buffalo, with jobber's profit added.

Anthracite—The situation is hard to define, for while the supply is next to noth-

ing, the demand is heavy and insistent. Retailers send their wagons to the trestles on days when coal is to be had, but often not more than half the long line gets any coal. Then the customer blames the dealers because the orders are not filled. At the same time the cellars must contain more coal than in any summer during previous years. The county fuel administrator has asked for 900,000 tons of anthracite, but so far is only promised a minimum that shall run above 700,000 tons, which is only a little more than has been distributed in former winters.

The fuel administrator on July 24 fixed the city prices of coal at the curb at $9.30 for grate, $8.95 for egg, $9.20 for stove, $9.25 for chestnut, $7.80 for pea and $7.75 for buckwheat. This is $1.85 per ton more than the wholesale price. Retailers in ordinary times always contended that they ought to get a margin of $1.50, but competition often cut it down to 85 cents.

Lake shipments of anthracite are increasing again, being for the week 114,700 net tons, of which 53,500 tons cleared for Duluth and Superior, 30,200 tons for Chicago, 14,900 tons for Milwaukee, 7500 tons for Waukegan, 7000 tons for Fort William, 1000 tons for Depere and 600 tons for Mackinaw.

CLEVELAND

Local bituminous coal requirements have been made subsidiary to the pressing demand for supplies for the Northwest. Industrial stocking of bituminous has been ended until after Oct. 1. Industrial concerns well stocked are to be denied further shipments and will be compelled to dig into their stockpiles.

Bituminous—Above all developments in both the local bituminous and the Lake trade are the general orders of the United States Fuel Administration giving the right-of-way to shipments for the Northwest. It is hoped that Lake shipments may be brought up to schedule by Oct. 1, and consequently, every ton of coal possible must be rushed up the Lakes. Industrial plants that have from four to six months' supply on hand must not expect further supplies at present. Industrial stocking will be cut to a minimum.

Bituminous coal has proved more and more difficult for retail dealers in Cleveland and northern Ohio to obtain the past few days, and most dealers are considerably behind on orders. It is stated that less than one-fourth of the domestic requirements for bituminous for this winter have been satisfied to date. Car supply in the southern Ohio fields continues 100 per cent. or close to that figure. The labor situation has not improved, but the inauguration of the new Federal plan for recruiting labor Aug. 1 will help some, operators believe.

Anthracite—Virtually no anthracite is reported entering the Cleveland and northern Ohio market, but dealers are expecting further supplies for domestic consumers before cold weather sets in.

Lake Trade—Bituminous for the Northwest in the early part of the week was coming forward at the rate of 1,000,000 tons a week, but shipments in the latter part of the week have brought the estimate to a lower level. Revised figures for the week ending July 20 now place the shipments to the Northwest at 913,672 tons. First figures for the week ended July 27 place shipments at 978,800 tons. As has been the case all season, capacity is far in excess of cargoes.

DETROIT

Improvement in supply of domestic coal fails to develop. Household distribution is delayed. Lake shipments show gain.

Bituminous—For the present interest of local jobbers and retail dealers is held by the small volume of coal available for domestic use that is being received in Detroit. While the bituminous shipments arriving are lighter than in previous years, the supply of steam coal seems to be sufficient to meet present needs of the consumers, though not much opportunity is given for adding to reserves.

As regards consumers of domestic coal, the situation is less satisfactory. The stock coming in is largely mine run and not adapted for use in the ordinary household heating plant, while there is a marked scarcity of domestic lump and sizes favored by domestic users. This condition is made more vexatious by the fact that under regulations of the state fuel administrator a largely increased use of bituminous coal is made necessary as a substitute for anthracite, coke and smokeless coal.

Anthracite—Incoming shipments of anthracite are small, some days amounting to fewer than 30 cars and seldom exceeding 40 cars. The dilatory method of supplying the needs of Detroit consumers while shipments of large volume are being sent elsewhere is preventing distribution among consumers at a time when it should be well under way. The Detroit Board of Commerce has decided to intervene in the interest of residents of Detroit and Michigan.

Headed by President J. J. Crowley, a committee of 15 prominent Detroiters left Sunday to appeal to the Federal Fuel Administrator to expedite movement of coal into Detroit and to urge also that the state's allotment of 1,201,000 tons of anthracite be increased to an amount more nearly commensurate with requirements and to a degree that in part at least will offset the loss of some 600,000 tons of coke and smokeless coal diverted from Detroit for war purposes.

Lake Trade—Coal has been moving rather freely to lake loading docks during the week and it is estimated by shippers that nearly 1,000,000 tons of cargo coal were loaded last week. Vessel supply offered for loading exceeds the available cargoes and a heavier movement will be necessary to meet the schedule of shipments for the month.

COLUMBUS, OHIO

A steadier car supply is helping production in all Ohio fields. Strong demand for all sizes is still reported from every quarter. The Lake trade is especially active.

Production figures continue to rise in all mining districts because of a better car supply and steadier employment. There is still a labor shortage but that is to be expected under the circumstances. On the whole the market is in good shape as the demand for all grades and sizes remains strong. Prospects indicate a continuation of the strong demand for domestic, steam and Lake tonnage.

The Lake business is being rushed as fast as possible as producers and shippers wish to forestall a possible priority order later in the season. The vessel movement is active, although some boats are still going to the head of the Lakes light, because of lack of coal tonnage at the Lower Lake ports. The ore trade is rushing and the Federal authorities are making every effort to get the ore to the manufacturing sections. The shortage at the head of the Lakes is still a matter of deep concern as it is feared that the Lake trade can not be pushed much stronger than at present.

CINCINNATI

Improved car supply and beginning of river shipments have helped receipts. Volume of movement is satisfactory and demand heavy.

The receipt in Cincinnati of a large shipment of river coal which was sent down by an artificial wave, added materially to the total volume of fuel available. The first of a series of such shipments, this transportation medium will undoubtedly be an important factor during the remainder of the summer. Better car conditions at many mines were also reported last week, enabling operators to forward more coal. The movement through this gateway for the Lake ports and other Northern destinations was correspondingly heavier. Local receipts are satisfactory, although the wants of dealers and consumers in this immediate section have to give way, to a large extent, to the requirements of those more distant from the mines, in accordance with the policy of the Government in the distribution of fuel. The demand for storage continues to be heavy and insistent, especially from domestic consumers, who in many cases are worried over their winter's coal supply. The trade is confident that the needs of the public, both for industrial and domestic purposes, will be met next winter more thoroughly and generally than last winter, both on account of improved production and distribution and on account of the fact that everybody has been educated to the necessity of taking coal when it is available, thus freeing the distributing machinery for essential work later on.

LOUISVILLE, KY.

Demand continues strong for all grades of coal, with slack in somewhat lighter call due to the placing of nut and slack on the same relative basis.

Coal production in the western Kentucky field has suffered during the past two or three weeks due to heavy draft calls on colored laborers. In eastern Kentucky white labor is used principally, and the recent calls haven't affected such labor so greatly.

At the present time the mines are getting a good supply of cars, and a good movement of coal and coke is being noted considering the short supplies of labor obtainable.

In a retail way the situation shows little change. The local dealers are far behind on orders, and coal is scarce, with few yards with any supply on hand, and being forced to make deliveries directly from cars as rapidly as the coal can be secured. Orders now on hand will keep the trade busy for more than two weeks. About the only coal to be had at this time is western Kentucky and a little Hazard coal, eastern Kentucky grades being practically unobtainable.

BIRMINGHAM

Production showing a slow but steady gain. Market conditions good as regards demand, inquiries being strong for domestic, while steam appears to be a little easier than last week. Car shortage reported in a few instances, but so far this has not crippled production.

A general improvement is noted in the output of coal in the Alabama field during the past week or so and the production is expected to show a steady gain from now on. The slackers are receiving requests from the Fuel Administration to work full time, and the forces at the mines are being increased by the addition of men from other less essential industries.

Local conditions as regards the demand and supply show little or no change over last week, reports from some distribution sources indicating a slightly easier steam market, though inquiries are still strong and much in excess of the supply.

Domestic trade, both wholesale and retail, is active, and there is a pressing demand on the mines for every ton that can be produced. Everybody appears to be anxious to lay in coal at once, hence such abnormal immediate requirements cannot be met. Coal is being stored at a satisfactory rate, though retailers are not receiving the desired tonnage to meet orders in hand.

Slight interruptions to operations have been experienced by mines on the Southern and Frisco recently by the lack of equipment for loading. However, there has been no serious delay on this account so far and the loss in production has been immaterial.

Coke

CONNELLSVILLE

Market offerings negligible despite increased production. Still more byproduct coke.

While the production of Connellsville coke has been increasing slightly of late there is still little offered in the open market, except of foundry grade. Furnacemen think it can hardly be long until there are relatively free offerings in the market, and if such a condition obtains there is a possibility of prices being affected, for there is admittedly quite a handsome profit in coke making at the Government prices, much more than there is in the production of coal. It is well recognized in the trade, from all past experiences, that when there is a slight shortage of coke it is extremely easy to sell while when it is a bit plentiful it is difficult to sell.

While the production of Connellsville coke has increased but slightly of late, the mere fact that any increase at all has occurred is quite encouraging, considering that in the past two months the 180 new byproduct ovens of the American Steel & Wire Co., at Cleveland, have been put in operation, and 128 ovens of the Carnegie plant at Clairton. The Connellsville region has to ship correspondingly more coal and for it to maintain and even increase its coke output is doing well. Another case of more byproduct coke is the 60-oven addition to the Bethlehem Steel Co.'s 120 ovens at Steelton, put in operation July 9, increasing the output at Steelton by fully 20,000 tons a month. The next byproduct plant will be the National Tube Co.'s 208 ovens at Lorain, some of the ovens now being in process of drying out, and full output from the plant is expected by September.

The market remains quotable at the set limits for furnace and foundry coke, $6 and $7 respectively, per net ton at ovens. Limits on other descriptions are: Crushed, over ¾-in., $7.30; crushed, under ¾-in., $5; breeze, $3.

The "Courier" reports production in the Connellsville and Lower Connellsville region in the week ended July 20 at 351,650 tons, a decrease of 1720 tons.

Buffalo—The demand is heavy, both for commercial sizes and domestic small stuff. The furnaces obtain supplies from the producers with difficulty, but manage to keep running. Consumers of breeze and gas

coke get a small amount. The Fuel Administration allows $4.54 for breeze at the place of production, but some shippers still sell it at the old price of $2.45 at the ovens. The receipts of iron ore by Lake keep up well, the amount for the week being 322,232 gross tons.

Middle Western

GENERAL REVIEW

Rumor that jobber's 15c. margin is to be abolished, and another to effect that Government is to take over several Middle West mines.

The most noticeable feature of the coal market for the past week was a large number of rumors, all of which, for the present at least, are without official confirmation or sanction. The most important of these rumors is to the effect that the United States Fuel Administration is contemplating a ruling which will abolish the 15c. per ton margin charged by a jobber for his purchasing agents' commission. If this rumor becomes a rule, it will mean that if the jobber is to continue in business it will be necessary for him to purchase his coal from the operator on a basis of at least 15c. per ton under the current Government price. As the average operator today can sell his entire output without the slightest bit of trouble, the outlook for the jobber is pretty black. We understand that there is enough foundation to this rumor to have caused a committee from the National Coal Jobbers' Association to hurry to Washington to take the matter up with the proper parties.

Another rumor which has gained considerable credence is that the Government will shortly take over a number of the larger coal-producing properties in this territory. It appears that some of the operators are not taking the care they should of the orders given them by the various Fuel Administration representatives, and for this reason, to enforce a compliance of its orders, the Fuel Administration is planning to step in, which will result in Government supervision and control of the mines in question. It is said that the problem will be handled in a manner similar to the Federal management of the railroads.

The last and least important of these current rumors is that there will be modification in Zone C which will bar shipments of Illinois coal from moving to certain districts of Iowa, which at the present time are in the Illinois zone.

CHICAGO

Market has eased up. Labor situation at mines much improved. High grade domestic coals firm. Steam trade stocking up. Some coals selling below Government price.

There has been a decided easing up of the market during the past few days. This is all the more remarkable in view of the fact that the Government about a week ago placed orders aggregating between two hundred thousand and three hundred thousand tons to be used at the various Government training camps, munitions factories, etc., throughout the Middle West. The only explanation for the present easing up of the market in the face of this large order is that the mines had an unusually good production week. The labor situation was perhaps a little better, as men are moving to the mines, anticipating the "Work or Fight" order, and the car supply all over the territory was extremely good.

High-grade domestic coals are of course firm, but this position has been weakened some by unusually large receipts of Lake coal. The steam trade is purchasing coal freely and stocking up what coal they do not use for their current needs, as a sort of insurance pile for the winter months. All the better grade coals from most of the producing districts are selling on a basis of Government price current at time of shipment, but there are some coals that are selling considerably below the price set by the Government.

Quotations in the Chicago market are as follows, per net ton, f.o.b. cars at mines:

	Williamson and Franklin	Saline and Harrisburg	Fulton and Peoria	Springfield	Carterville	Grundy, La-Salle, Bureau and Will.
Steam lump	$2.55@2.70	$2.55@2.70	$2.95@3.10	$2.55@2.70	$2.55@2.70	$3.25@3.40
Domestic lump	2.55@2.70	2.55@2.70	2.95@3.10	2.55@2.70	2.55@2.70	3.25@3.40
Egg or furnace	2.55@2.70	2.55@2.70	2.95@3.10	2.55@2.70	2.55@2.70	3.25@3.40
Small egg or nut	2.55@2.70	2.55@2.70	2.95@3.10	2.55@2.70	2.55@2.70	3.25@3.40
Stove	2.55@2.70	2.55@2.70	2.95@3.10	2.55@2.70	2.55@2.70	3.25@3.40
Chestnut	2.55@2.70	2.55@2.70	2.95@3.10	2.55@2.70	2.55@2.70	3.25@3.40
Pea	2.55@2.70	2.55@2.70	2.95@3.10	2.55@2.70	2.55@2.70	3.25@3.40
Washed egg	2.75@2.90	.....	.....	2.75@2.90	2.75@2.90	3.45@3.60
Washed stove	2.75@2.90	.....	.....	2.75@2.90	2.75@2.90	3.45@3.60
Washed nut	2.75@2.90	.....	.....	2.75@2.90	2.75@2.90	3.45@3.60
Mine-run	2.35@2.50	2.35@2.50	2.75@2.90	2.35@2.50	2.35@2.50	3.00@3.15
Screenings	2.05@2.20	2.05@2.20	2.35@2.50	2.05@2.20	2.05@2.20	2.75@2.90
Washed slack	2.05@2.20	2.05@2.20	.....	2.05@2.20	2.05@2.20	2.75@2.90

MILWAUKEE

Increasing receipts of anthracite by Lake. Small dealers embarrassed by short allotment. No schedule of prices fixed. Conservation notes.

Anthracite has been coming in freely of late. Since last week's report five cargoes, aggregating 34,300 tons, have been put upon the docks. This makes a total of 209,891 tons of anthracite since the opening of navigation. The dock companies are not giving retailers a sufficient supply, however, and many small dealers are unable to supply their customers promptly. Some refuse to book any more orders until this situation changes. If present conditions should continue for any length of time, the smaller or "desk-room" middlemen are bound to be eliminated.

Stocks of bituminous coal were increased to the extent of 92,239 tons by cargo arrivals during the week, making the total since the opening of navigation 1,200,746 tons.

The anthracite schedule has not been announced as yet, and all coal deliveries made thus far remain unbilled. The state fuel administrator and fuel board continue to wrestle with the problem of fixing the margin of profit to dealers. The former maximum of $2.25 per ton has been pronounced too high.

The breweries of the city have been notified that they can use hydro-electric power in excess of the amount of coal they are permitted to consume. This rule does not apply to wood, however, even if such fuel is available without railway transportation. Illinois screenings are also forbidden in excess of the 50 per cent. fuel allotment.

A saving of 20 per cent. in the amount of fuel used by industries in Wisconsin is the purpose of Charles A. Cahill, state administrative engineer. The Milwaukee Street Railway Co. promises a saving of 10,000 tons of coal annually if it is allowed to inaugurate a skip-stop system. The matter is under consideration by the city authorities.

Two lightless nights per week are now the order in Milwaukee—Mondays and Tuesdays.

Fire is consuming 300 tons of bituminous coal in the bunkers of the lighting and heating plant of the University of Wisconsin at Madison. The bunkers are so situated that poisonous gases defeat every attempt to attack the burning mass.

The Dane County, Wis., fuel administrator has cut deliveries of coal in Madison from two-thirds to one-half, where the total amount exceeds six tons.

ST. LOUIS

The market shows a tendency to stiffen on Standard grades. The demand, however, is quiet both locally and in the country, and steam has been slow in moving. Car supply extremely poor and the distribution poorly managed. Transportation shows improvement. Large tonnage to move to Michigan.

The local situation has toned up somewhat in the past week principally because the tonnage is not available. In addition to the car shortage there is something radically wrong with the method of distribution. Some mines work every day and others only two or three days a week, taking the men away from some good operations to work at others that are supplied with the cars. Inquiries as to how this occurs bring no results and several operators are threatening to take the case to Washington and show up the inability to follow or the utter disregard for car distribution rules.

Screenings, which have been heavy, are picking up in a way on account of the coming shortage.

During the past week it has been agreed between the fuel administrator for Missouri, Wallace Crossley, and F. C. Honald, district representative of Chicago, who is in charge of the distribution of Illinois coal, that all the surplus in the Standard field on the lines of the Wabash, B. & O., Vandalia, L. & N. and Southern can move to Michigan, as prescribed by Mr. Honald, for a period of 60 days. This is going to bring about a tightening up of the local market and also convince local buyers that conditions are somewhat acute in other places if not at home.

The domestic call for Standard coal is not as good as might be expected. The labor problem is still a serious one in this field, but this is principally at mines where the car distribution has not been evenly pro-rated.

In the Mt. Olive field normal conditions continue to exist, with a car supply that is fairly good, a labor problem that is not bad, and a tonnage produced about equal to the demand.

The railroads still continue to take coal in large quantities from the Carterville field where there is a scarcity of cars and where transportation is not as good as in the other regions.

The labor problem in this field is about stationary, inasmuch as the draft will not affect Illinois for the month of July, but with the coming of August there is a likelihood of several thousand miners being taken in the new draft.

Conditions in the Duquoin field are somewhat similar to those in the Carterville district, with the railroads still getting a good tonnage and the car supply being short.

There are no eastern coals of any kind coming in. A little Arkansas moved in the past week with an advance of $1.50 a ton tacked on it, in accordance with the recent agreement of the miners and fuel administration officials in Arkansas.

The demand is good locally for all kinds of high grade coal, and the local condition in so far as storage coal is concerned for domestic purposes is very satisfactory to the fuel administration.

The prevailing market is as follows, per net ton f.o.b. mines:

	Williamson and Franklin County	Mt. Olive and Staunton	Standard
6-in. lump	$2.55@2.70	$2.55@2.70	$2.40@2.70
3x6-in. egg	2.55@2.70	2.55@2.70	2.35@2.55
2x3-in. nut	2.55@2.70	2.55@2.70	2.35@2.55
No. 2 nut	2.55@2.70	2.55@2.70	.....
No. 3 nut	2.55@2.70	2.55@2.70	.....
No. 4 nut	2.55@2.70	2.55@2.70	.....
No. 5 nut	2.05@2.20	2.05@2.20	.....
2-in. scrgs	2.05@2.20	2.05@2.20	1.25@1.50
3-in. lump	.....	.....	2.25@2.40
2-in. lump	.....	.....	2.25@2.40
Steam egg	.....	.....	2.25@2.40
Mine run	2.35@2.50	2.35@2.50	1.85@2.00
Washed:			
No. 1	2.75@2.90	2.75@2.90	.....
No. 2	2.75@2.90	2.75@2.90	.....
No. 3	2.55@2.75	2.55@2.75	.....
No. 4	2.55@2.75	2.55@2.75	.....
No. 5	2.05@2.20	2.05@2.20	.....

Williamson and Franklin County rate is $1.10; Duquoin field, $1; Standard and Mt. Olive fields, 95c.

SEATTLE

Car supply now adequate, but labor shortage holds up production. Domestic consumers lag in placing orders for fuel and last winter's experiences likely to be repeated.

The car supply in the state, while not wholly satisfactory, is said by the operators to be nearly equal to demands, and coal is getting away from the mines as fast as it is being produced. The shortage of labor, however, is now quite a problem. Labor officials estimate that the western Washington mines alone are short about 400 men at the present time, with no indication that this want can be supplied. Coal operators throughout the state report that they are operating to capacity and yet are unable to meet the demand. This is not coming from the domestic or householder consumer, but from industrial plants and railroads. The householder is not heeding the many warnings to purchase coal early, with the result that last winter's experiences are likely to be repeated this year. Owing to the impairment of the hoisting equipment of the Wellington Coal Co. bunkers, Nanoose Wellington coal shipped from British Columbia to this city will have to be delivered to bunkers in West Seattle; and to cover the additional expense the Fuel Administrator has permitted a raise in price of 20c. per ton. As the Canadian Fuel Administration has allowed a raise in the price of coal at the mines of the Wellington Coal Co., the United States Coal Administration has also permitted a raise in the retail price here of 65c. per ton on lump and 25c. on nut and pea of the Wellington variety. In coal circles this action is believed to foreshadow an increase in other Canadian coals on the local markets.

CURRENT PRICES—MATERIALS & SUPPLIES

IRON AND STEEL

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$3.60

PIG IRON—Below are the present quotations, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
CINCINNATI			
No. 2 Southern foundry	$36.90	$36.90	$49.90
No. 2 Northern foundry	.....	36.26	56.20
NEW YORK †			
No. 2 X Northern foundry	34.40	34.40	54.25
No. 2 plain Northern foundry	33.90*	33.90	53.75
No. 2 Southern foundry	40.70	39.00	52.75
BIRMINGHAM			
No. 2 Southern foundry	33.00	33.00	47.00
CHICAGO			
No. 2 Northern foundry	33.00	33.00	55.00
No. 2 Southern foundry	38.00	38.00	.....
PITTSBURGH			
Bessemer iron *	36.60	36.60	55.95
Basic iron *	32.00	32.00	53.00

* These prices include the freight charge from the valley to the Pittsburgh district. † Delivered Tidewater, New York.

STRUCTURAL MATERIAL—The following are the base prices, f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York Current	New York One Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$3.00	$4.245	$5.25	$4.27	$4.27
Channels, 3 to 15 in.	3.00	4.245	5.25	4.27	4.27
Angles, 3 to 6 in., ¼ in. thick	3.00	4.245	5.25	4.27	4.27
Tees, 3 in. and larger	3.05	4.245	5.30	4.27	4.27
Plates	3.225	4.745	9.00	4.52	4.52

BAR IRON—Prices in cents per pound at cities named are as follows:

Pittsburgh	St. Louis	Denver	Birmingham
3.50	4.24	4.60	4.50

NAILS—Prices per keg from warehouse in cities named:

	Mill Pittsburgh	St. Louis	Denver	Chicago	Birmingham	San Francisco	Dallas
Wire	$3.50	$4.50	$5.05	$4.32	$4.75	$5.95	$4.75
Cut	4.00	5.50	.....	4.47	....	6.40	.....

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh	Cincinnati	Chicago	St. Louis	San Francisco	Birmingham	Denver
Standard railroad spikes ⅝-in. and larger	$3.90	$6.00	$4.50	$5.30	$6.70	$6.00	$5.00
Track bolts	4.90	8.90	5.50	Prem.	8.00	8.00	6.00
Standard section angle bars	3.25	....	4.45	Prem.	5.15	.....	4.30

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring fair-sized lots, the following discounts hold:

Cincinnati	Cleveland	Chicago	St. Louis	Denver	Birmingham
17½%	List	+10%	+15%	+40%	+30%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.75	$7.00	$6.50	$6.25	$8.00	$7.50
Assorted	5.50	7.00	6.50–7.00	6.40	8.25	7.75

Cincinnati—Horseshoe nails sell for $4.50 to $5 per 25-lb. box

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York 1-Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco
4 in.	$64.35	$64.35	$68.50	$64.80	$63.00	$80.50
6 in. and over	61.35	61.35	65.50	61.80	60.00	77.50

Gas pipe and 16-ft. lengths are $1 per ton extra.

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard Bessemer rails	$57.00	$38.00	$67.00	$38.00
Standard openhearth rails	55.00	40.00	65.00	40.00
Light rails, 8 to 10 lb.	*3.135 (100 lb.)	80.00	*3.135 (100 lb.)	68.00
Light rails, 12 to 14 lb.	*3.09 (100 lb.)	82.00	*3.09 (100 lb.)	67.00
Light rails, 25 to 45 lb.	*3.00 (100 lb.)	75.00	*3.00 (100 lb.)	65.00

* Government price per 100 lb.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York	Chicago	St. Louis
No. 1 railroad wrought	$30.80	$30.00	$34.00
Stove plate	22.50	23.50	19.00
No. 1 machinery cast	34.00	28.00	21.50–22
Machine shop turnings	15.30	16.00	19.00
Cast borings	15.30	16.75	18.50
Railroad malleable cast	30.30	30.00	25.50–26

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver
$0.12	$0.16½	$0.18	$0.19	$0.17½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	15c.	14c.	15c.
Hollow	24c.	25c.	....

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	44%	17%	⅜ to 1½	33%	17%
½	48%	33⅓%			
¾ to 3	51%	37½%			

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD. EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	36½%			
¾ to 1½	49%	36½%			

LAP WELD. EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

From warehouses at the places named the following discounts hold for steel pipe:

	New York Black	Chicago Black	St. Louis Black
⅜ to 3 in. butt welded	33%	39%	37%
3½ to 6 in. lap welded	15%	43%	33%

	New York Galvanized	Chicago Galvanized	St. Louis Galvanized
⅜ to 3 in. butt welded	16%	28%	22%
3½ to 6 in. butt welded	+3	25%	19%

Malleable fittings. Class B and C, from New York stock sell at list price Cast iron, standard sizes, 5%.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$2.50*	List	$1.40	$1.65	$1.05	$3.00
Hot pressed hexagon	2.50*	List	1.20	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.40	1.00	1.60
Cold punched hexagon	2.50*	List	.75	1.40	1.00	2.00

* List plus.

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	30%	46%	37%
Larger and longer up to 1 in. by 30 in.	15%	40%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... $2.50 Cleveland..... $3.00 Chicago..... $2.50

For cast-iron washers the base price per 100 lb. is as follows:

New York..... $5.00 Cleveland..... $4.00 Chicago..... $3.50

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	30%	45—5%	45%*
Tinned	30%	45—5%	45%*

Button heads, ¾, ⅞, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:

New York..$5.65 Cleveland...$5.15 Chicago....$5.67 Pittsburgh...$4.65

Coneheads, same sizes:

New York..$5.75 Cleveland...$5.25 Chicago....$5.77 Pittsburgh..$4.75

MISCELLANEOUS

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Cincinnati	St. Louis	Birmingham	Denver
Cup	7	13.0	8½	12½
Fiber or sponge	8	13.0	8½	20
Transmission	7	13.0	9	20
Axle	4½	4.1	3¾	5½
Gear	4½	7.0	8	9
Car journal	22 (gal.)	4.3	5½	8½

BABBITT METAL—Warehouse prices in cents per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	125.00	70.00	108.00	70.00	100.00	70.00
Commercial	70.00	40.00	23.00	24.50	24.00	25.00

HOSE—Following are prices of various classes of hose:

Fire

	50-Ft. Lengths
Underwriters' 2½-in	75c. per ft.
Common, 2½-in	40%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.55	$0.30	$0.25

Steam—Discounts from list

First grade....30% Second grade....30-5% Third grade....40-10%

LEATHER BELTING—Present discounts from list in cities named:

	Medium Grade	Heavy Grade
St. Louis	40+5%	35%
Denver	40%	30%
Birmingham	35%	35%
Chicago	45%	40%
Cincinnati	40—10%	40%

RAWHIDE LACING—40—5% off list.

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+20%
Galvanized cast steel rigging	List
Bright plain rigging	30%
Bright cast steel	17½%
Bright iron and iron tiller	5%

MANILA ROPE—For rope smaller than ½-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ⅝-in., 6; ¾-in., 4½; 1 in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½-in. and larger, in 1200-ft. coils:

Boston	$0.34	Birmingham	$0.38
New York	.36	Denver	.35½
Cincinnati	.33½	Kansas City	.34
Chicago	.34	Seattle	.34
St. Paul	.34	St. Louis	.34
San Francisco	.32	Los Angeles	.35

PIPE AND BOILER COVERING—Below are discounts and part of standard lists:

PIPE COVERING

Pipe Size	Standard List Per Lin. Ft.
1-in.	$0.27
2-in.	.36
6-in.	.80
4-in.	.60
3-in.	.45
8-in.	1.10
10-in.	1.30

BLOCKS AND SHEETS

Thickness	Price per Sq.Ft.
½-in.	$0.27
1 -in.	.30
1½-in.	.45
2 -in.	.60
2½-in.	.75
3 -in.	.90
3½-in.	1.05

85% magnesia high pressure ..... List

For low-pressure heating and return lines ..... 4-ply ..... 58% off; 3-ply ..... 60% off; 2-ply ..... 62% off

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrel	$1.86	$1.16	$2.00	$1.20	$1.97	$1.21
5-gal. cans	1.96	1.26	2.15	1.35	2.17	1.36

* Nominal.

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current Dry and In Oil	1 Year Ago Dry and In Oil
	Dry	In Oil	Dry	In Oil		
100-lb. keg	14.00	14.50	13.25	13.50	14.00	13.00
25 and 50-lb. kegs	14.25	14.75	13.50	13.75	14.25	13.25
12½-lb. keg	14.50	15.00	13.75	14.00	14.50	13.50
5-lb. cans	.....	.....	15.25	15.50	15.00	15.50
1-lb. cans	.....	.....	.....	.....	17.00	.....

COMMON BRICK—The prices per 1000 in cargo or carload lots are as follows:

Cincinnati	$13-16.75	Birmingham	$13.75
St. Louis	12.00	Denver	8.50

WIRING SUPPLIES—New York prices for tape and solder are as follows:

Friction tape, ½ lb. rolls	38c. per lb.
Rubber tape, ¼-lb. rolls	45c. per lb.
Wire solder, 50-lb. pools	46c. per lb.
Soldering paste, 2-oz. cans	$1.20 per doz.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco.

	1-Ply		2-Ply		3-Ply	
	C.l.	L. C.l.	C.l.	L.C.l.	C.l.	L.Cl.
No. 1 grade	$1.30	$1.55	$1.60	$1.75	$1.90	$2.05
No. 2 grade	1.15	1.30	1.45	1.60	1.75	1.90

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.95 per roll in carload lots and $2.20 for smaller quantities.

Shingles, red and green slate finish cost $5.25 per square in carloads, $5.50 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less than Carload Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	64	65
Tar pitch (in 400-lb. bbl.)	21	22
Asphalt pitch (in barre's)	37	42
Asphalt felt	72.50	77.50

HOLLOW TILE—The price per 1000 in carload lots f.o.b. mine is as follows:

	4 x 12 x 12	8 x 12 x 12
St. Louis	$74.00	$138.00
Chicago	79.00	137.00
Denver, per ton	None	None
Kansas City	75.00	140.00
St. Paul	56.00	110.00
Boston	80.00	150.00
Birmingham	72.00	135.00
Cincinnati	72.75	136.10
Pittsburgh	86.50	147.10

LUMBER—Price of yellow pine per M in carload lots:

	1-in. Rough 10 In. x 16 Ft.	2-In. T. and G. 10 In. x 16 Ft.	8 x 8 In. x 20 Ft.
St. Louis	.....	$40.00	$40.00
Birmingham	$33.00	33.00	28.50
Denver	40.00	42.00	42.50
Cincinnati	45.00	44.00	39.00

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill, in Carloads	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
*No. 28 black	5.00	6.495	6.445	10.00	6.42	9.50	6.52	9.50
*No. 26 black	4.90	6.395	6.345	9.90	6.32	9.40	6.42	9.40
*Nos. 22 and 24 black	4.85	6.345	6.295	9.85	6.27	9.35	6.37	9.35
Nos. 18 and 20 black	4.80	6.295	6.245	9.80	6.22	9.30	6.32	9.30
No. 16 blue annealed	4.45	5.695	5.645	9.70	5.62	9.70	5.72	9.70
No. 14 blue annealed	4.35	5.595	5.545	9.60	5.52	9.60	5.62	9.60
No. 10 blue annealed	4.25	5.495	5.445	9.50	5.42	9.50	5.52	9.50
*No. 28 galvanized	6.25	7.745	7.695	13.00	7.67	11.00	7.77	11.00
*No. 26 galvanized	5.95	7.445	7.395	12.70	7.37	10.70	7.32	10.70
No. 24 galvanized	5.80	7.295	7.245	12.55	7.22	10.55	7.47	10.55

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages

COPPER WIRE—Prices per 1000 ft. for rubber-covered wire in following cities:

	Denver			St. Louis			Birmingham		
No.	Single Braid	Double Braid	Duplex	Single Braid	Double Braid	Duplex	Single Braid	Double Braid	Duplex
14	$15.00	$20.00	$35.00	$12.00	$16.00	$33.00	$13.00	$17.40	$36.80
10	25.65	28.90	57.45	27.20	31.00	63.00	21.40	24.40	42.75
8	36.45	40.25	80.30	38.00	42.00	78.00	42.35	44.35	.....
6	57.40	61.70	.....	.....	65.00	130.00	64.60	74.00	.....
4	83.40	88.70	.....	.....	93.00	.....	101.75	106.05	.....
2	126.60	132.80	.....	.....	140.00	.....	151.50	.....	.....
1	164.15	172.40	.....	.....	182.00	.....	201.00	.....	.....
0	206.80	206.80	.....	.....	242.00	.....	276.00	.....	.....
00	278.80	278.80	.....	.....	290.00	.....	317.00	.....	.....
000	341.65	341.65	.....	.....	360.00	.....	417.00	.....	.....
0000	417.05	417.05	.....	.....	435.00	.....	516.00	.....	.....

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25-lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.27½	$0.34½	.....	$2.40
Boston	$0.24½	.27½	.34½	$0.41½	2.40
Cincinnati	.18½	.22½	.27½	.....	2.25
Kansas City	.20	.26½	.33½	.43½	2.45
Seattle	.17½	.29½	.31½	.41½	.....
Chicago	.18½	.22½	.33	.43	2.35
St. Paul	.19	.23	.28	.43½	2.75
St. Louis	.19	.26½	.33½	.43½	2.35
Denver	.18	.25½	.32½	.42½	2.45
Dallas	.23	.30½	.37½	.47½	.....
Los Angeles	.22	.28	.36	.....	.....
San Francisco	.17½*	.23½*	.30½*	.40½*	.....

* Carload lots.

FREIGHT RATES—On finished steel products in the Pittsburgh district including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates per 100 lb. are effective:

Boston	$0.27	New Orleans	$0.385
Buffalo	.17	New York	.245
Chicago	.27	Philadelphia	.23
Cincinnati	.23	St. Louis	.34
Cleveland	.17	St. Paul	.495
Denver	.99	Pacific Coast (all rail)	1.25
Kansas City	.59		

Note—Add 3% transportation tax.